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NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



THESIS

**A CASE STUDY OF MAGNAVOX AS A MODEL
FOR PROCESS ORIENTED CONTRACT
ADMINISTRATION SERVICES (PROCAS)
IMPLEMENTATION**

by

Steve Dollase

December 1995

Thesis Advisor:

Danny Shockley

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**A CASE STUDY OF MAGNAVOX AS A MODEL FOR PROCESS
ORIENTED CONTRACT ADMINISTRATION SERVICES (PROCAS)
IMPLEMENTATION**

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Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL

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ABSTRACT

This thesis examines the implementation of the Process Oriented Contract Administration Services (PROCAS) program at Magnavox Electronic Systems Company in Fort Wayne, Indiana, one of the seven pilot sites for the program. PROCAS is a Defense Contract Management Command (DCMC) initiative designed to apply the tools of total quality management, including cross-functional teaming, continuous process improvement, and empowerment, to the contract administration process. PROCAS supports DCMC's performance based management philosophy, which strives to allocate resources based on assessed contractor risk. The study describes the development, objectives, and components of the PROCAS program. Implementation of PROCAS at Magnavox is analyzed to determine the factors that contributed to the success of the initiative. Barriers to implementation and problems with the implementation are identified and discussed. The benefits of PROCAS for both the Government and Magnavox are analyzed. The study concludes that the implementation was successful, and recommends continuing support of PROCAS by DCMC. Potential areas for expansion of the PROCAS philosophy are identified. The study shows the value of PROCAS in facilitating a total quality transformation of an organization, and in improving the efficiency and effectiveness of Government contract administration.

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I. INTRODUCTION

A. PURPOSE

This thesis examines the implementation of Process Oriented Contract Administration Services (PROCAS) at Magnavox Electronic Systems Company in Fort Wayne, Indiana. The implementation is examined from the perspective of the Defense Plant Representative Office Magnavox (DPRO) and from the perspective of the Magnavox Electronic Systems Company. Barriers which the Government and Magnavox faced during the implementation are identified and examined. Factors contributing to the success, and factors reducing the effectiveness of the PROCAS initiative at Magnavox are evaluated. Lessons learned are developed and recommendations presented to improve the success of PROCAS implementation and operation in the future.

B. BACKGROUND

In the wake of the fall of the Soviet Union, the Department of Defense (DOD) has experienced substantial budget reductions. These budget reductions have impacted every facet of the DOD, and have been particularly severe in the DOD procurement account. [Ref. 1] Resource reductions have necessitated that DOD perform its procurement operations more cost effectively.

The Defense Contract Management Command (DCMC) is responsible for providing contract administration services to the military Services, other Department of Defense components, Federal Civil Agencies and, when authorized, to Foreign Governments. [Ref. 2] As a result of DOD budget reductions, DCMC has found it necessary to reduce the cost of contract administration.

Coincident with the DOD budget reductions, has been an increased emphasis by industry and Government in the United States to the value of total quality management initiatives. The DOD and its industry counterparts have realized the potential gains in efficiency and effectiveness possible through the utilization of total quality management concepts including continuous process improvement, statistical process control, empowerment of employees, and cross functional teams.

PROCAS is a DCMC initiative resulting from the combination of a number of contract administration programs including the Contractor Risk Assessment Guide (CRAG), In-plant Quality Evaluation (IQUE), Manufacturing Systems Review (MSR), and Integrated Systems Evaluation (ISE) under a single umbrella strategy. [Ref. 3] PROCAS has its genesis in DCMC's desire to more efficiently and effectively perform contract administration services, and utilizes total quality management concepts to achieve these objectives. As such, it has enabled DCMC to reduce the cost of contract administration.

DPRO Magnavox was one of DCMC's seven pilot sites for PROCAS implementation. As such, it was incumbent upon Magnavox Electronic Systems Company and DCMC to define and implement the PROCAS strategy, and to serve as a model for implementation of PROCAS across the DCMC commandery. The consensus within DCMC and Magnavox is that this mandate was successfully achieved, and that there are lessons to be learned from the Magnavox PROCAS implementation for all Government/contractor relationships.

C. THESIS OBJECTIVE

The primary objective of this research is to analyze the implementation of PROCAS at Magnavox to determine the factors that contributed to a successful implementation. The contributions of PROCAS to efficiency and effectiveness of contractor operations and Government contract administration will also be investigated. Lessons learned will be garnered for application to other PROCAS implementations.

D. RESEARCH QUESTIONS

This research will answer the following primary and subsidiary research questions.

1. Primary

What elements contributed to a successful implementation of PROCAS at Magnavox?

2. Subsidiary

- a. What is PROCAS?
- b. How was PROCAS implemented at Magnavox?
- c. What were the issues, problems and barriers that had to be overcome?
- d. What steps did Magnavox and the Government take to ensure the success of the PROCAS implementation?
- e. How has the implementation process been nurtured to maintain momentum?
- f. What actions are required to sustain PROCAS at Magnavox in the long-term?
- g. How can the lessons learned at Magnavox be applied to facilitate implementation and utilization of PROCAS at other contractor locations?

E. SCOPE AND LIMITATIONS OF RESEARCH

This research is designed as a case study of the implementation of PROCAS at Defense Contract Management Office (DCMO) Magnavox and Magnavox Electronic Systems Company in Fort Wayne, Indiana. The implementation is analyzed from both the Government and Magnavox perspectives.

Magnavox operations at its facilities in other states are not analyzed. PROCAS initiatives with contractors other than Magnavox are not studied.

Much of the information for this study was obtained through interviews with Government and industry

representatives involved in the implementation, and as such, has been molded by the forces of human memory. However, differences between the recollections of individuals interviewed did not impact the nature of this study's findings.

This research will not provide an exact template that can be followed for utilization of PROCAS at every contractor location. Rather, it provides an analysis of one successful implementation, and ideas and lessons learned that will be beneficial to other Government/contractor partnerships.

F. METHODOLOGY

Data for this study were primarily gathered through interviews with current and former Government and industry representatives involved with PROCAS and the implementation of PROCAS at Magnavox Electronic Systems Company. Government representatives interviewed included employees of the Defense Contract Management Command, Fort Belvoir, Virginia; the Defense Contract Management Area Operations (DCMAO) office, Indianapolis, Indiana; and the Defense Contract Management Office (DCMO) Magnavox, Fort Wayne, Indiana.¹ Industry

¹ During the course of this study, the DCMC field office responsible for providing contract administration services for Government contracts at Magnavox Electronic Systems Company in Fort Wayne, Indiana was changed from a Defense Plant Representative Office (DPRO) to a Defense Contract Management Office (DCMO). The distinction between the two types of offices will be discussed in Chapter 2.

representatives interviewed were predominately employees of Magnavox Electronic Systems Company.

The interviews were primarily conducted during on-site visits by the researcher. Supporting data and information were also provided by interviewees during on-site visits. Additional interviews were conducted by telephone.

A review of professional journals and periodicals, and previous research on PROCAS provided additional supporting data.

G. ORGANIZATION OF STUDY

Chapter I discusses the background, objectives and organization of this thesis.

Chapter II reviews the history, structure and mission of DCMC. It then discusses the organization and operations of DCMO Magnavox, and of the Defense Contract Audit Agency (DCAA) satellite office in Fort Wayne, Indiana.

Chapter III reviews the organization and operations of the Magnavox Electronic Systems Company.

Chapter IV discusses the evolution of DCMC's PROCAS program, including the programs which preceded PROCAS. It then discusses the format of the PROCAS program.

Chapter V analyzes the environment at Magnavox Electronic Systems Company and DPRO Magnavox prior to PROCAS implementation. It reviews the implementation process and the barriers to implementation of PROCAS at Magnavox, and analyzes

the implementation, focusing on factors that contributed to or undermined the success of the initiative. The chapter reviews the action being taken by the Government and Magnavox to maintain the momentum of the initiative, and potential problems which may be confronted in the future.

Chapter VI presents conclusions drawn by the researcher and provides recommendations for PROCAS initiatives at other DCMC/contractor sites.

II. THE DEFENSE CONTRACT MANAGEMENT COMMAND (DCMC)

A. DEFENSE CONTRACT MANAGEMENT COMMAND (DCMC) HISTORY AND STRUCTURE

Prior to the formation of DCMC, administration of DOD contracts was accomplished by the individual Services through separate Air Force, Navy and Army Plant Representative Offices, (AFPROs, NAVPROs, and ARPROs respectively), and by nine Defense Contract Administration Service Regions (DCASRs). [Ref. 4]

In June 1989, Secretary of Defense Cheney submitted a Defense Management Report (DMR) to President Bush recommending a number of improvements to the DOD acquisition process. [Ref. 5] Included in the report was a recommendation to consolidate all contract administration functions for DOD contracts, including those currently administered by the Defense Logistics Agency (DLA), under a single entity. According to Secretary Cheney:

The consolidated management of contract administration will provide uniform procurement policy, permit upgrading in the quality of the CAS workforce, and reduce overhead and payroll costs. The consolidated management also permits the CAS structure to be streamlined from nine regions into five districts. [Ref. 6]

President Bush agreed with Secretary Cheney's recommendation, and on 26 February 1990, as a result of Defense Management Review Decision 916, the Defense Contract Management Command was formed.

DCMC was created as an arm of the Defense Logistics Agency (DLA). [Ref. 7] As DOD's Joint-Service combat support activity, DLA provides logistics support common to each of the military Services, commanders-in-chief, other DOD components, and authorized foreign Governments. DLA accomplishes this through supply centers, depots, service centers and DCMC. [Ref. 8] The relationship of DLA within the DOD is shown in Figure 1.

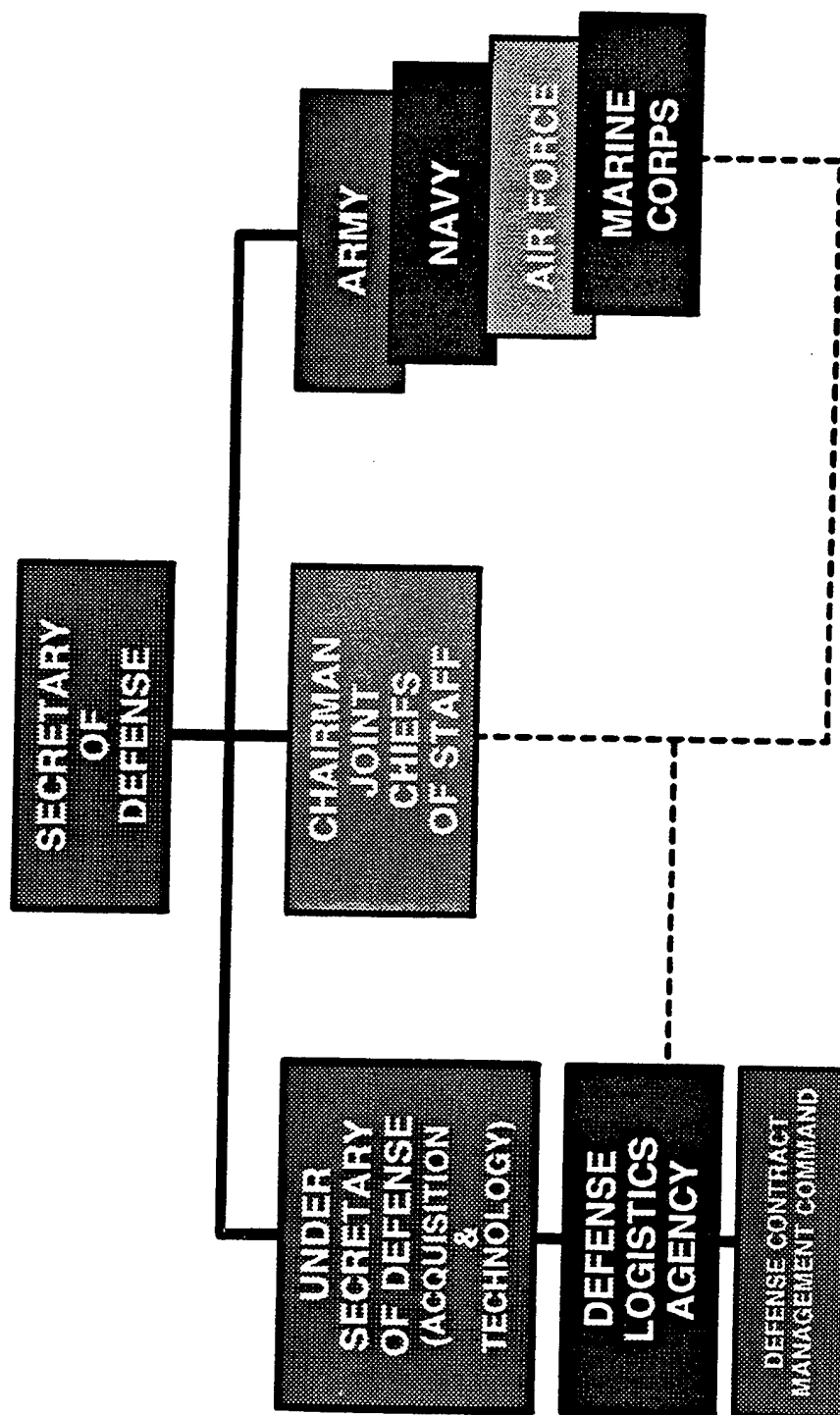
The mission of DCMC is stated as follows:

We provide worldwide contract administration services (CAS) in support of DOD components, National Aeronautics and Space Administration, and other federal and international organizations. [Ref. 9]

DCMC performs a variety of functions to accomplish its mission including the following:

- Provides contract management services including contract administration services.
- Performs price/cost analysis, overhead and contractor system reviews, financial services, property and plant clearance, transportation and packaging, and termination settlements.
- Provides quality assurance by verifying that products conform to contract specifications.
- Provides program and technical support by analyzing cost, schedule, and technical performance of contractor programs and systems. [Ref. 10]

In performing contract administration services, DCMC follows the guidance of Federal Acquisition Regulation (FAR)



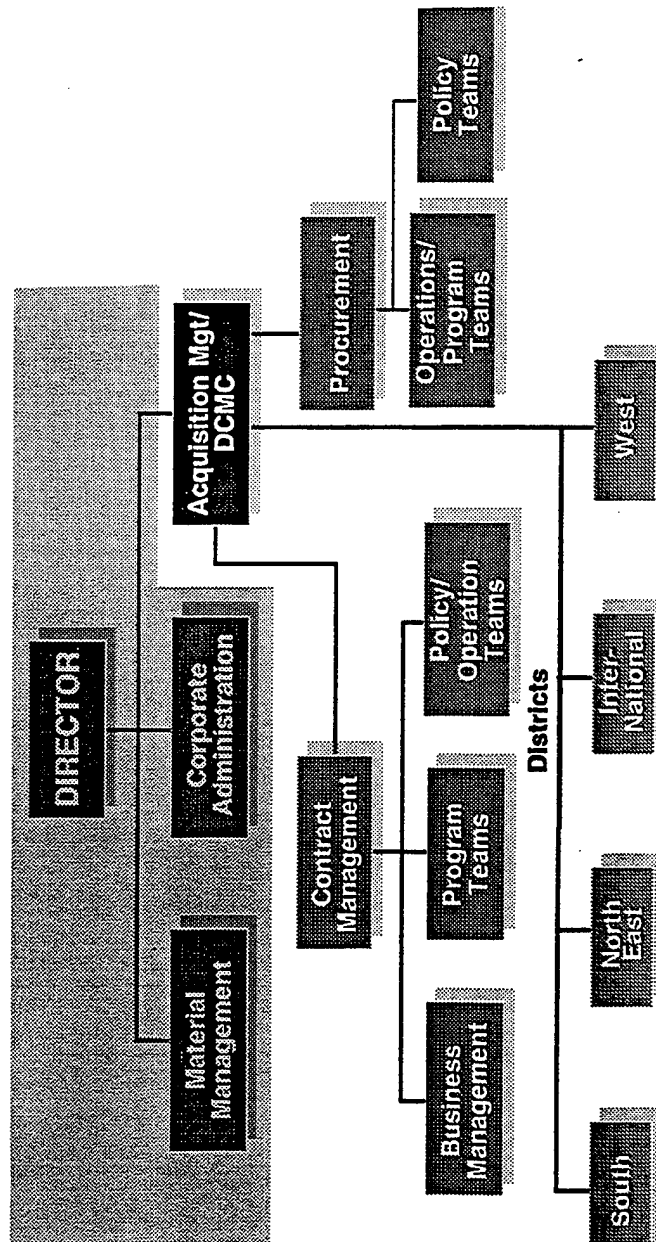
Source: DCMC Command Brief

Figure 1. Relationship of DLA Within the DOD

42.302, which lists 68 normal contract administration functions to be performed by DCMC Contract Administration Offices (CAOs), and 11 additional functions which may be performed by the CAO with specific authorization from the contracting office. DOD agencies planning to delegate contract management functions outside their specific organization must delegate that workload to DCMC. [Ref. 11] Currently, DCMC with its more than 18,000 personnel, manages over 350,000 prime contracts with more than 30,000 contractors. The total value of these contracts exceeds \$800 billion. [Ref. 12]

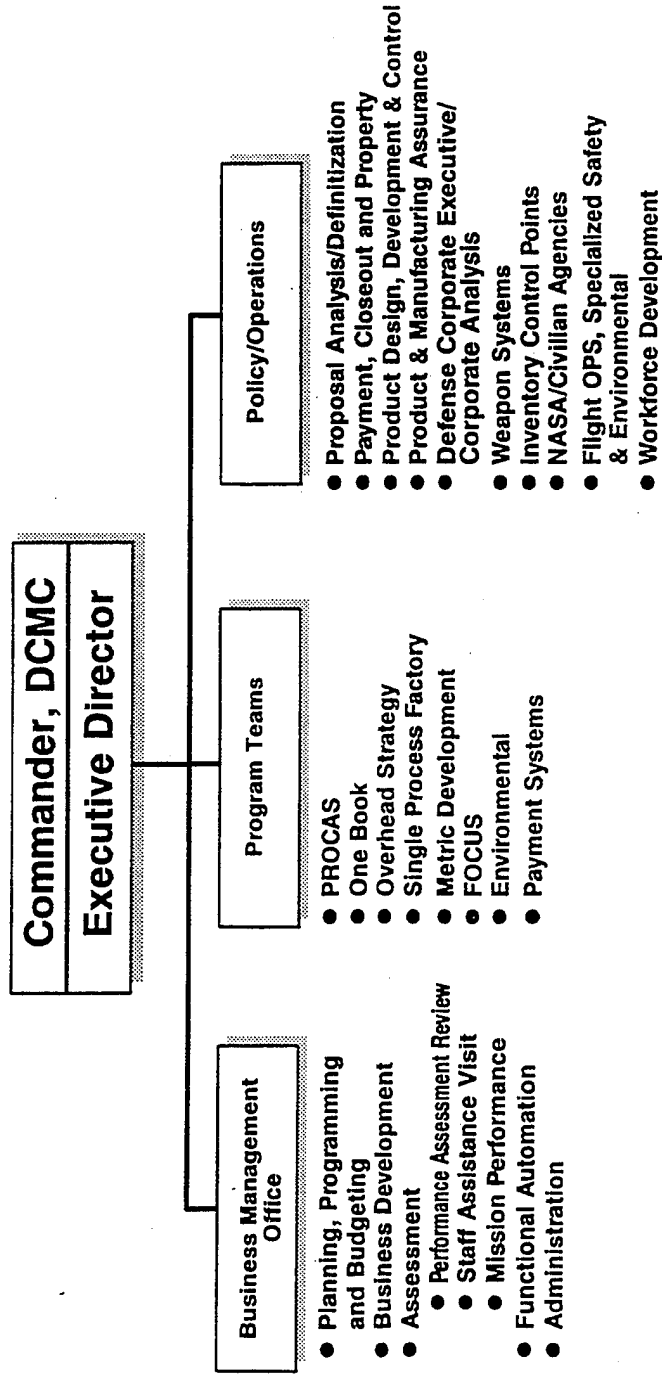
The Commander of DCMC is a two star billet which rotates among the Army, Navy and Air Force. This individual also serves as the DLA Deputy Director for Acquisition, and reports in both capacities to the Director of DLA. The Organization of DCMC is shown in Figure 2.

DCMC is organized with a headquarters (recently relocated from Cameron Station, Alexandria, Virginia to Fort Belvoir, Virginia), and four districts: Western, Southern, Northeast, and International. The organization of DCMC Headquarters, and of the districts is shown in Figures 3 and 4 respectively.



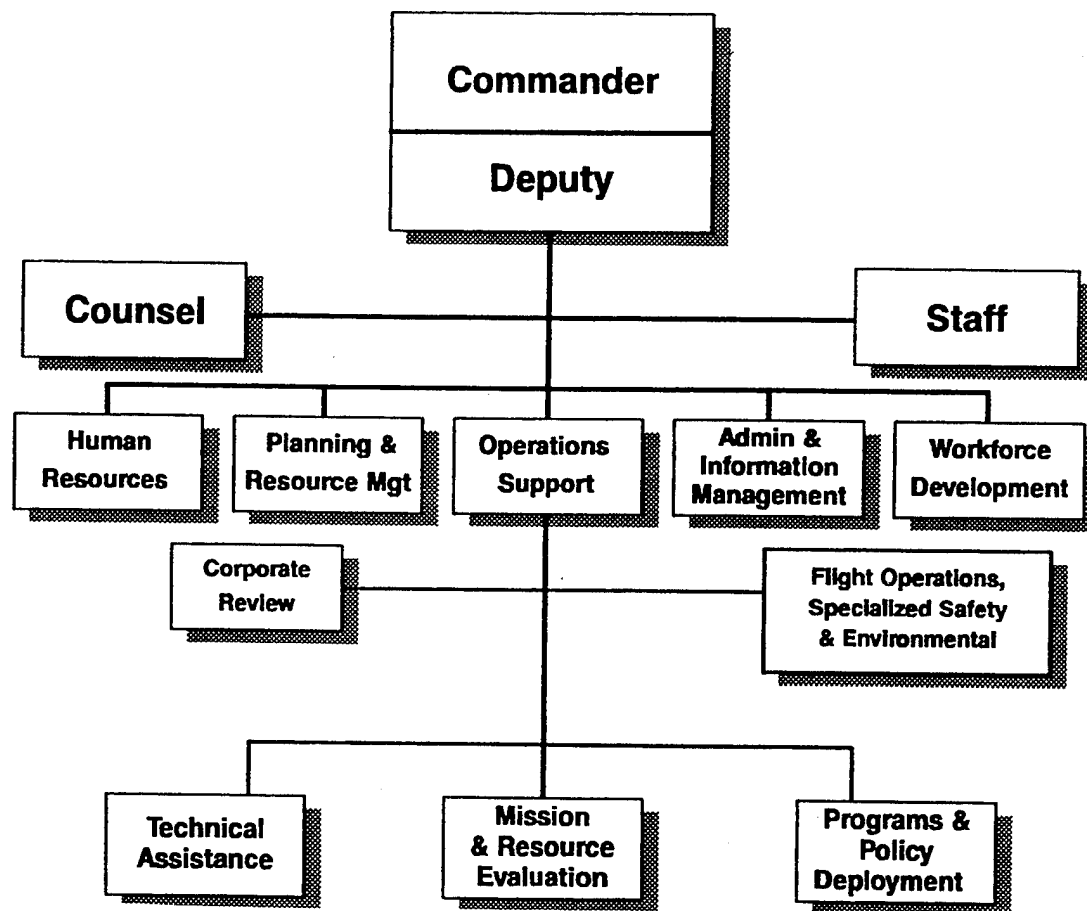
Source: DCMC Command Brief

Figure 2. DCMC Organization Within DLA



Source: DCMC Command Brief

Figure 3. DCMC Headquarters Organization



Source: DCMC Command Brief

Figure 4. DCMC District Organization

DCMC Headquarters is responsible for providing uniform policy and procedural guidance, field office performance evaluation, and special problem resolution within the DCMC commandery.

The four districts are organized to provide operational support and management oversight of DCMC field offices. The districts are responsible for ensuring that policy developed at DCMC Headquarters is implemented at the field offices. Over the past few years, as a result of decisions made by the Congressional Base Realignment and Closure Commission, DCMC has consolidated its districts from six in 1993 to the present four. A further consolidation is currently in progress, and should be completed within the next year, at which point there will be only two districts, Eastern and Western. The International district will most likely be absorbed by DCMC Headquarters. DCMO Magnavox is a part of the Northeast district, upon completion of the district consolidation it will be a part of the Eastern district. [Ref. 13]

Within each district are a number of contract administration field offices, which may be either Defense Contract Management Area Operations (DCMAO) offices, Defense Plant Representative Offices (DPROs), Defense Contract Management Offices (DCMOs), or Residency Offices. DCMAOs are typically responsible for a large region and numerous contractors. Personnel at a DCMAO will work from a central site to administer all contracts within a defined geographical

area of their district. DPROs are established at the sites of large contractors' plants, administering all DOD contracts at those contractors' plants. Both DCMAOs and DPROs are capable of providing a full range of contract administration services, and both report directly to their respective district commander. A DCMO is a smaller CAO, normally located at a contractor's plant, and reports to either a DCMAO or a DPRO. DCMOs may have the capability to perform the full range of CAS, or may be limited to a few selected functions for which on-site presence is required. A Residency office is also located at a contractor's site, and reports to a DCMAO or DPRO. Residencies are responsible for specific contract administration functions, often limited to quality assurance.

B. THE DEFENSE CONTRACT MANAGEMENT OFFICE (DCMO) MAGNAVOX

As previously mentioned, the CAO at Magnavox in Fort Wayne was changed from a DPRO to a DCMO in June 1995. The DCMO now reports to DCMAO, Indianapolis, Indiana. DCMO Magnavox is responsible for the contract administration of Magnavox Electronic Systems Company, Midwest Division. DCMO Magnavox administers over 300 contracts valued at nearly two billion dollars. The Vision Statement of DCMO Magnavox is as follows:

Through innovation and team work, DCMO Magnavox strives to achieve process improvement across command functions to yield enhanced quality and improved customer satisfaction. We work together

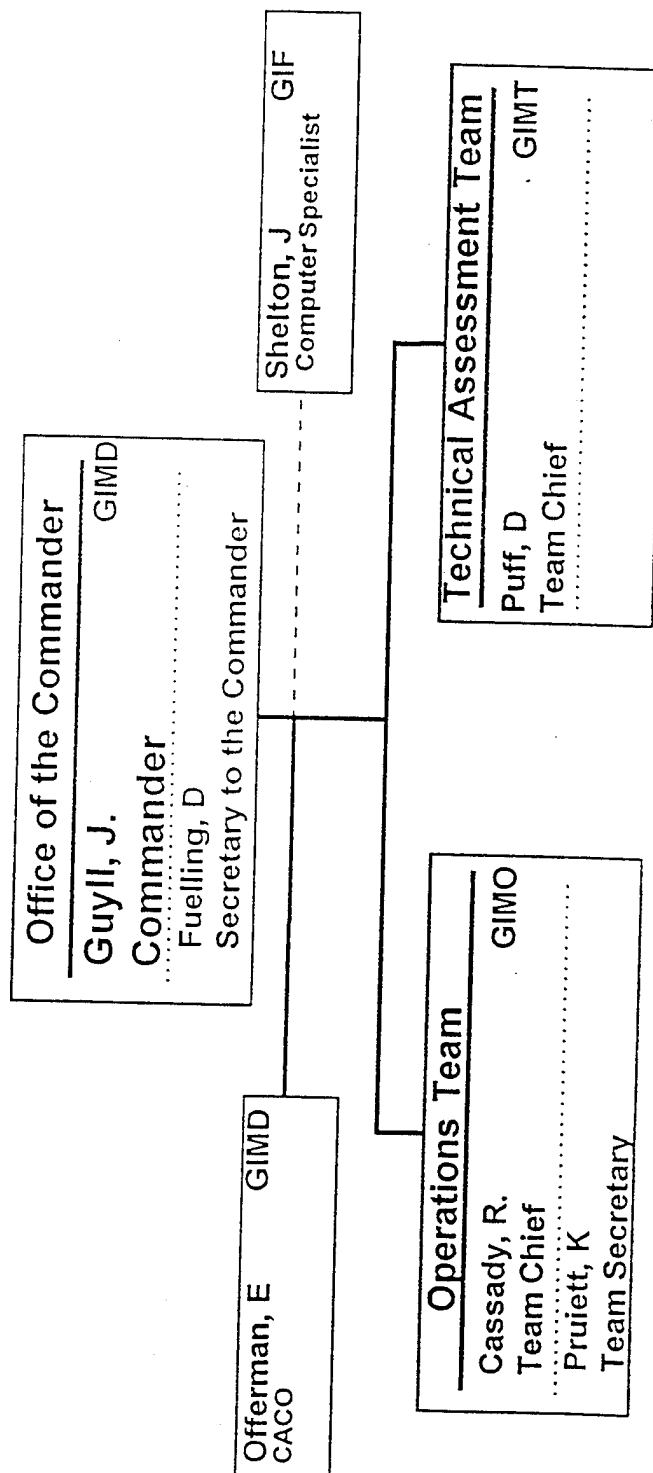
to efficiently and effectively provide contract administration services prescribed by law and regulation. DCMO Magnavox shares a consistency of purpose with our customers and strives for continuous process improvement. [Ref. 14]

The mission statement of DCMO Magnavox which supports this vision statement is:

To provide efficient and effective contract management services assuring delivery of quality products and services within cost and on time.
[Ref. 15]

As will be discussed in future sections, these statements mesh well with the fundamental philosophy of PROCAS, which focuses on continuous process improvement, innovation, and cross-functional teaming.

The Commander of DCMO Magnavox is an Army Major, an 0-4 billet. Before the realignment to a DCMO, DPRO Magnavox was headed by a Navy Commander, an 0-5 billet. The DCMO organization is divided into three main sections: the Operations Group, the Technical Assessment Group, and the Corporate Administrative Contracting Officer (CACO). [Ref. 16]
The organization of DCMO Magnavox is shown in Figure 5.



Source: DCMO Magnavox Organizational Guide

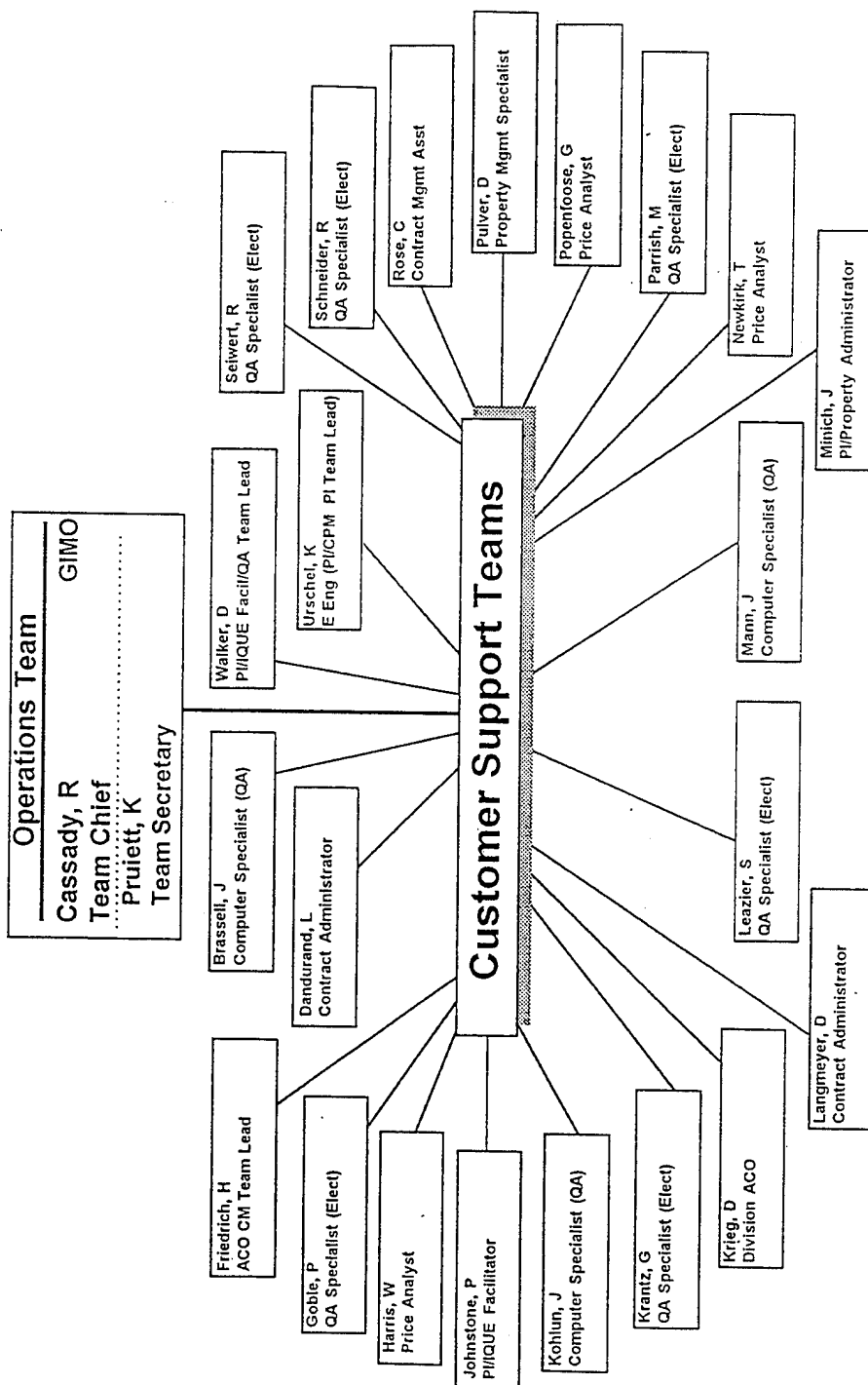
Figure 5. DCMO Magnavox Organization

1. The Operations Group

The Operations Group is headed by a GS-1101-14. The group consists of four cross-functional teams: Contract Management Team, Program Integration Team, Quality Assurance Team, and Business Surveillance and Support Team. The Operations Group organization is shown in Figure 6. The Contract Management Team is headed by an Administrative Contracting Officer (ACO), and is responsible for contract administration functions. The Contract Management Team performs functions such as:

- Receiving contract delegations from buying commands.
- Ensuring deliveries are made on schedule and within cost.
- Monitoring and enforcing the terms and conditions of contracts.
- Overseeing contractor payment, including reviewing and approving progress payments.
- Monitoring the financial condition of the contract.
[Ref. 17]

The Program Integration Team is made up of a number of Program Support Teams, one of which is established for each major program. Program Support Teams are led by a Program Integrator, and include representatives from various functional specialties including: contract administration, financial, quality assurance, property management, and engineering. These cross-functional teams work together to



Source: DCMO Magnavox Organizational Guide

Figure 6. DCMO Magnavox Operations Group Organization

administer all contracts within a given program, with the Program Integrator serving as a primary point of contact on all program managed contracts.

The Quality Assurance Team is responsible for evaluating product quality and performance through analysis and evaluation of the contractor's processes. These processes include: design, engineering, development, production, and testing. Their goal is to obtain quality improvements through continuous process improvement and proactive quality efforts, rather than concentrating on end item inspection. [Ref. 18]

The Business Surveillance and Support Team includes such functions as: cost and price analysis, property management, and the Contractor Performance Measurement (CPM) Monitor.

The CPM Monitor is responsible for managing contracts using Cost/Schedule Control Systems Criteria (C/SCSC). [Ref. 19] The CPM Monitor performs this function through use of the contractor's validated Integrated Management System (IMS). Through the IMS System, management information can be obtained to identify actual or potential technical, schedule, or cost impacts on a contract. Once the IMS System has received tri-service validation, the CPM Monitor leads the IMS System surveillance efforts to ensure the system continues to provide the required management information. At DCMO Magnavox this function is performed using a total quality approach

through joint cross-functional teams. [Ref. 20]

According to the DCMO Magnavox Organizational Guide:

At DCMO Magnavox, the surveillance effort is performed by a Joint DCMO/Defense Contract Audit Agency (DCAA)/Magnavox C/SCS Surveillance Team consisting of the DCMO CPM, Engineer, Price Analyst, a DCAA representative, and two Magnavox representatives. The establishment of this team at DCMO Magnavox has been recognized by Office of the Under Secretary of Defense (Acquisition and Technology) as a model approach for improved management and reduced oversight and by DCMC as a best practice. [Ref. 21]

2. The Technical Assessment Group

The Technical Assessment Group is headed by a GS-801-13, and consists of the Engineering and Manufacturing Systems Surveillance Team. According to the DCMO Magnavox Organizational Guide:

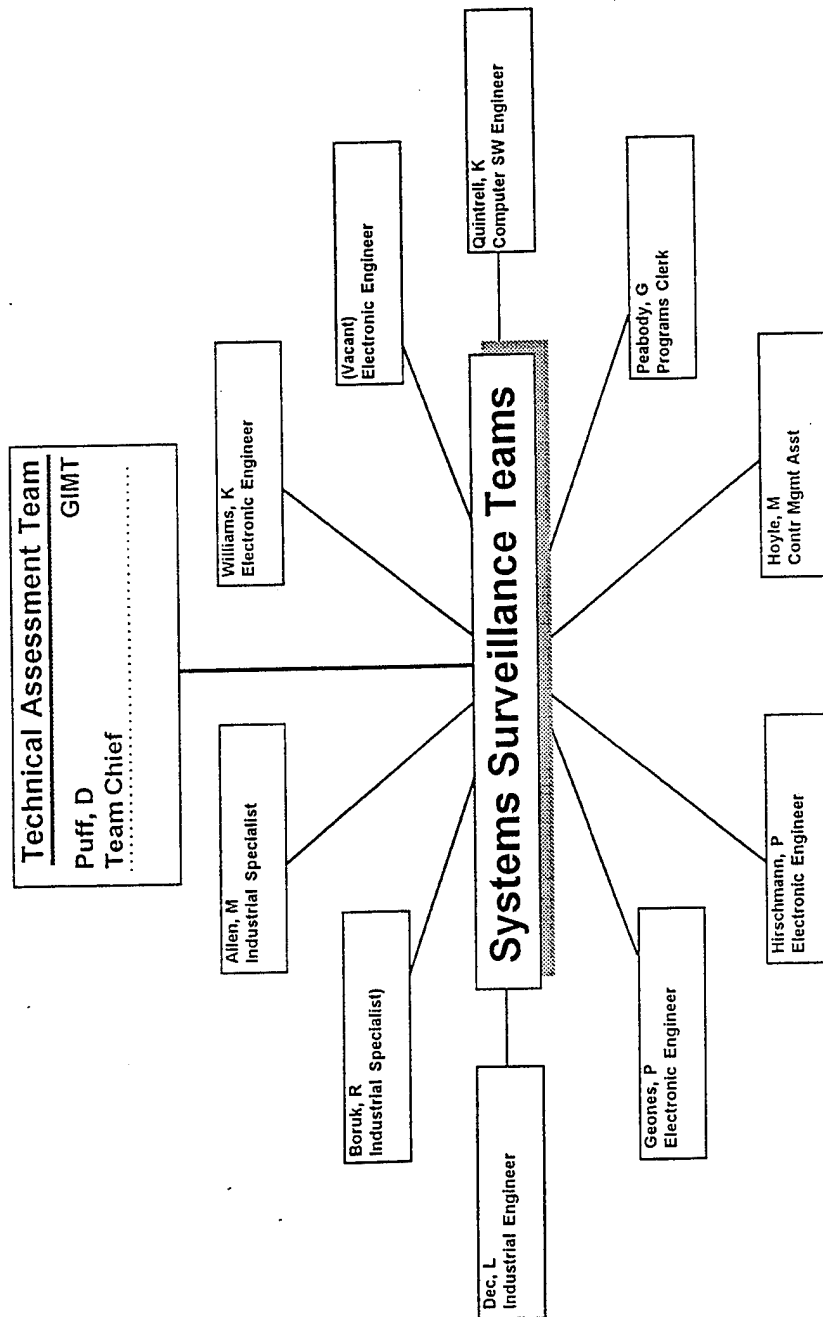
This team (the Engineering and Manufacturing Systems Surveillance Team) comprised of Engineers, Industrial Specialists, and Contract Management Assistants provides internal customers (Program Integrator, ACO, Price/Cost Analyst, Commander) with an assessment of the contractor's major systems (engineering, manufacturing, cost schedule variance analysis, subcontract management, etc.). This support combines personal experience, specialty expertise, the acquisition process, and knowledge of the contractor's operations to provide an independent assessment of the contractor's performance. [Ref. 22]

The organization of the DCMO Magnavox Technical Assessment Group is shown in Figure 7.

Source: DCMO Magnavox Organizational Guide

Figure 7. DCMO Magnavox Technical Assessment Group

Organization



3. The Corporate Administrative Contracting Officer (CACO)

The CACO is a GS-1102-14 appointed by the District Commander to serve as the DOD liaison with Magnavox corporate management. The CACO is responsible for providing information and assistance to Division ACOs, Program Integrators and other individuals within DCMC. In doing so, the CACO ensures uniformity and consistency of the contractor's policies, procedures and cost treatment through divisions and programs.

C. THE DEFENSE CONTRACT AUDIT AGENCY (DCAA)

The DCAA is a separate agency of the DOD under the direction of the Assistant Secretary of Defense (Comptroller). DCAA is responsible for providing contract audit services for the DOD, and accounting and financial advisory services for DOD components responsible for procurement and contract administration. DCAA has a full service satellite office, staffed by six individuals, located in the same building as the DCMO Magnavox office. Although the DCAA office is a separate entity, it works closely with DCMO Magnavox in fulfilling its mission. The DCAA office provides DCMO, and other entities responsible for Government procurement, with financial information and advice relating to financial matters. The office also evaluates the effectiveness, efficiency, and economy of Magnavox operations.

D. SUMMARY

The Defense Contract Management Command (DCMC) was formed in June 1989 as a part of the Defense Logistics Agency (DLA). DCMC was established in order to consolidate, reduce the cost of, and upgrade the quality of contract administration for the DOD. DCMC provides worldwide contract administration services to the DOD, the National Aeronautics and Space Administration, and other Federal and international organizations. Contract Administration Offices (CAOs) are DCMC's primary service providers. CAOs perform a variety of functions in delivering contract administration services to DCMC customers. CAOs are organized within DCMC by districts, of which there are currently four. The districts provide operational support and management oversight to the CAOs. DCMC headquarters supports the districts and CAOs by providing policy and procedural guidance, CAO performance evaluation and problem resolution. The four types of CAOs, in order of size are; Defense Contract Management Area Operations (DCMAO) offices, Defense Plant Representative Offices (DPROs), Defense Contract Management Offices (DCMOs), and Residency offices.

DCMO Magnavox, formerly a DPRO, provides contract administration services at Magnavox Electronic Systems Company in Fort Wayne, Indiana. DCMO Magnavox is comprised of three

main sections; the Operations Group, the Technical Assessment Group, and the Corporate Administrative Contracting Officer (CACO).

The Defense Contract Audit Agency (DCAA) also operates an office at Magnavox. This office provides contract audit services for the DOD, and accounting and financial advisory services for DOD components responsible for procurement and contract administration.

III. MAGNAVOX ELECTRONIC SYSTEMS COMPANY

A. COMPANY HISTORY

Magnavox Electronic Systems Company is a major supplier to the DOD of a wide variety of products and services. The firm was founded in 1911 as a loudspeaker company and was located in Napa, California. World Wars I and II allowed the company to expand into the production of military communications electronics. Building on its military production experience, Magnavox continued to expand and refine its technological capability. In 1974 the firm was acquired by the North American Philips Corporation, a U.S. subsidiary of N.V. Philips, Eindhoven, The Netherlands. Because of its foreign ownership, Magnavox was compelled to incorporate a Government division to protect sensitive technologies. The Government division was formed as a wholly owned U.S. subsidiary under the name of Magnavox Government and Industry Electronics Company (MAGIEC). At the request of the DOD, the stock of the Government division was placed in a voting trust, assuring Magnavox of the continuance of its high-level security clearances. On 22 October 1993, Magnavox was purchased for \$165 million, by MESC Holdings, Incorporated, a company organized by the Carlyle Group, L.P., a merchant banking firm based in Washington, D.C. [Ref. 23]

In September 1995, as this study was being researched, Magnavox was purchased by Hughes Aircraft, a subsidiary of Los

Angeles-based Hughes Electronics Corporation for \$370 million. The purchase price represented an increase of \$205 million or 124 percent over the price paid by the Carlyle Group less than two years earlier. [Ref. 24] A number of Magnavox personnel interviewed for this study attributed much of this increase in the firm's value to the various total quality initiatives, including PROCAS, utilized by Magnavox.

B. MAGNAVOX STRUCTURE AND OPERATIONS

Magnavox Electronic Systems Company is headquartered in Fort Wayne, Indiana with more than a dozen facilities in the Fort Wayne metropolitan area. The firm's headquarters and nine other facilities are located in the Magnavox Industrial Park located in the north side of Fort Wayne. Additional facilities are located to the west in Whitley County, approximately ten miles from the firm's headquarters. Magnavox also operates engineering centers, test facilities, and manufacturing plants at locations in Indiana, New Jersey and California. Over the past two years, as Defense budget reductions have impacted the volume of operations at Magnavox, the firm has eliminated excess capacity by selling some of its facilities in the Fort Wayne area. [Ref. 25]

Reduced workload has also forced Magnavox to down-size its workforce from over 8,800 in 1988 to approximately 3,000 at present. [Ref. 26] Magnavox employs both union

and non-union employees. In general, the production workers in the Magnavox Industrial Park facilities are unionized, those working in the Whitley County facilities are not. [Ref. 27] The workforce has an average age of 42, and an average time with the firm of twelve years. [Ref. 28] Magnavox's employees bring with them conservative Mid-west values including a strong work ethic, self-reliance, responsibility, and honest character. Magnavox officials interviewed for this study place great importance on their workers and their sense of values for the success of the firm, and its ability to successfully implement PROCAS.

Magnavox had sales in 1994 of approximately \$400 million, of which \$304.6 million is attributable sales from the firm's Midwest Division to the DOD. [Ref. 29] Magnavox is a major supplier to the DOD of defense electronics, including the following types of equipment:

- Airborne, ground and satellite communications, and navigation equipment.
- Command control systems.
- Electronic Combat (EC) systems, including electronic countermeasure, target recognition, and combat identification systems.
- Anti-submarine warfare electronics, including sonobuoys, underwater acoustic transducers, and multimode hydrophones.
- Displays and electro-optical systems such as infra-red and thermal imaging devices.
- Avionics for weapon systems and unmanned aerial vehicles (UAVs).

- Electronic safety and arming devices for munitions and ordinance. [Ref. 30]

Magnavox also produces systems for the commercial sector including marine electronics, communication and navigation systems, and commercial avionics.

To support the development and production of this wide variety of products, Magnavox maintains in-house capabilities in a wide range of aptitudes including engineering, research and development, software development, manufacturing, and quality control.

C. TOTAL QUALITY AT MAGNAVOX

Magnavox has placed significant emphasis on total quality management in all of its operations. The firm's mission statement is as follows:

Our mission is to apply state-of-the-art technology to the design, manufacture, sale and support of affordable and sophisticated communications and information systems for military and commercial applications. Our dedication to quality will ensure that both our customers and stakeholders will receive superior value. [Ref. 31]

The total quality initiatives at Magnavox are managed under an umbrella strategy titled Magnavox Total Quality Management (MTQM). Seven complementary total quality initiatives are managed under the MTQM strategy. These initiatives existed at Magnavox prior to its selection as one

of the seven pilot sites for PROCAS implementation. In fact, some of the initiatives have existed for as long as thirty years. The initiatives are coordinated by a steering committee comprised of top management and chaired by the firm's President and Chief Executive Officer. The current membership of this committee is shown by Figure 8. Magnavox also has, as part of its management staff, an individual whose title is Magnavox Total Quality Management Facilitator. This individual assists in the coordination of total quality initiatives at Magnavox. The seven primary total quality programs at Magnavox are:

1. **Just-In-Time/Total Quality Control (JIT/TQC):** utilizes the concepts of pull manufacturing, cross-functional teams, change management, process analysis, and employee empowerment to improve efficiency and quality and reduce cycle time.
2. **Manufacturing Resource Planning II (MRP II):** a business planning and execution methodology utilizing cross-functional teams to improve and streamline business processes from customer order to shipment of the product. Processes involved include order processing, releasing the design, material planning and ordering, planning and executing on the production floor, collecting and reporting costs, and shipping.
3. **Engineering Processes:** an integrated, consistent, and disciplined approach to the total engineering process which utilizes such concepts as concurrent engineering, process improvement and the development of supporting guides and standards. Promotes the goal of making engineering a contributory, process-driven organization.
4. **Program Management:** an evolution of the Cost/Schedule Control System Criteria (C/SCSC) Program which includes the disciplines of organization planning; resource planning; communication; risk planning; cost; schedule and technical planning; and execution and analysis. The discipline is responsible for tracking the

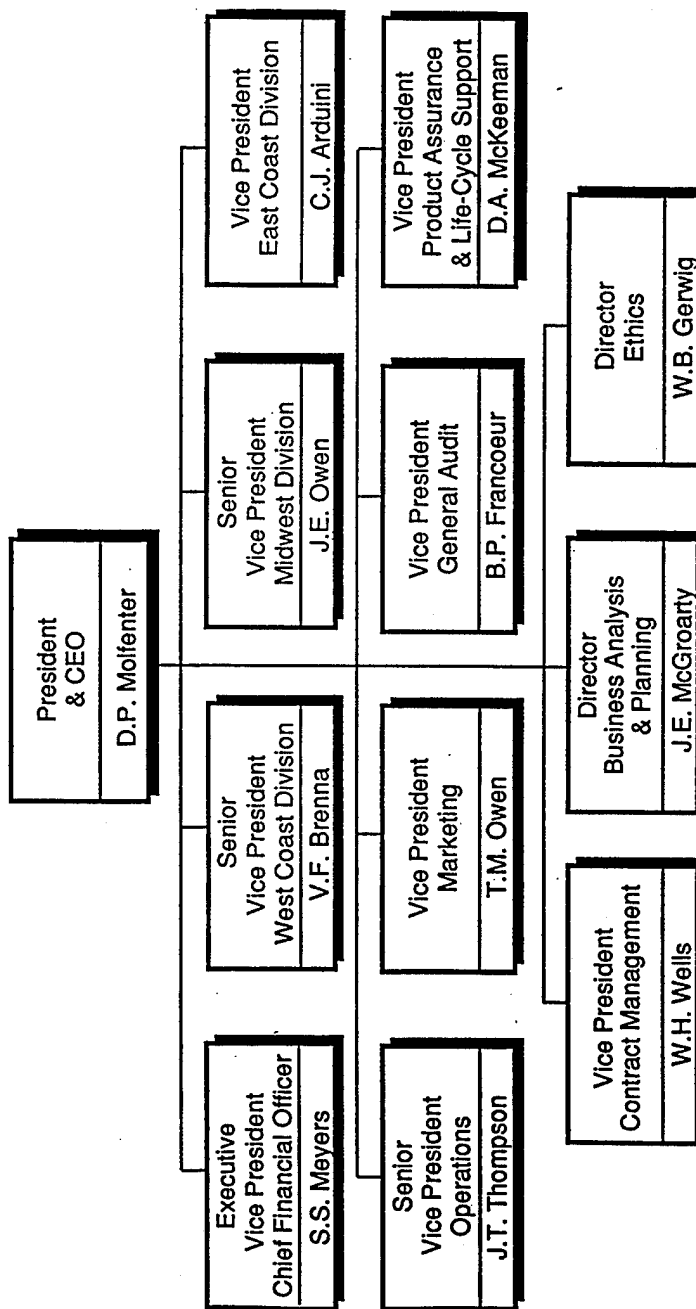
three critical areas of cost, schedule and performance.

5. **MAGIEC Circle:** this quality circle program utilizes approximately fifteen autonomous problem-solving teams to address such issues as process improvement, quality of work-life, health, safety, and scrap reduction. The teams are made up of volunteers, primarily hourly production workers.

6. **Supplier Partnerships:** helps develop suppliers as team members who stress the acceptance and accomplishment of the same quality standards used internally at Magnavox. A key facet is the Source Selection and Approval Committee, a cross-functional team responsible for supplier management. Training programs for suppliers are also utilized.

7. **Management Initiatives:** comprised of the areas of reorganization, marketing, cost tracking, systems engineering, purchasing, subcontracting, program management, optimize manufacturing, product support, test and acceptance, and transition to production. Assigned to top management, this initiative utilizes a cross-functional approach and coordination with other total quality efforts to improve processes and solve problems in these areas. [Ref. 32]

As will be discussed in Chapter V, the environment at Magnavox, with its emphasis on total quality, was somewhat responsible for the selection of Magnavox as a pilot site for PROCAS implementation. This environment also helped to accommodate the physical implementation of PROCAS at the firm, as the workforce had been previously introduced to the concepts of total quality management.



Source: Magnavox Electronic Systems Company

Figure 8. Magnavox Total Quality Management Steering Committee

D. SUMMARY

Magnavox Electronic Systems Company, headquartered in Fort Wayne, Indiana, has been a producer of electronic systems for the DOD since World War I. The firm's Midwest Division had sales to the DOD of approximately \$305 million in 1994. Like most defense contractors, Magnavox's DOD business has decreased significantly in the wake of defense budget reductions, forcing the firm to eliminate excess capacity and down-size its workforce. The firm's workforce, which is comprised of both union and non-union employees, has been reduced by approximately two-thirds since 1988.

Magnavox places significant emphasis on total quality in every aspect of its operations. Seven separate, complementary initiatives are managed under the firm's umbrella strategy which is termed Magnavox Total Quality Management (MTQM). This environment helped facilitate the implementation of PROCAS at Magnavox.

IV. EVOLUTION OF PROCESS ORIENTED CONTRACT ADMINISTRATION SERVICES (PROCAS)

A. HISTORY OF PROCAS

As previously discussed, the end of the Cold War has resulted in reduced defense spending since the late 1980s. Total DOD outlays have fallen from a high of \$354.1 billion in fiscal year 1989 to \$274.5 billion in fiscal year 1994.² This represents a decrease of over twenty-two percent. Additional decreases of as much as \$50 billion are projected by fiscal year 2000 which would represent a total decrease over a twelve year period of nearly \$130 billion, or approximately thirty-seven percent. [Ref. 33]

An even more significant factor for defense contractors and DCMC has been the disproportionately large reduction in the DOD procurement accounts. According to a recent GAO study:

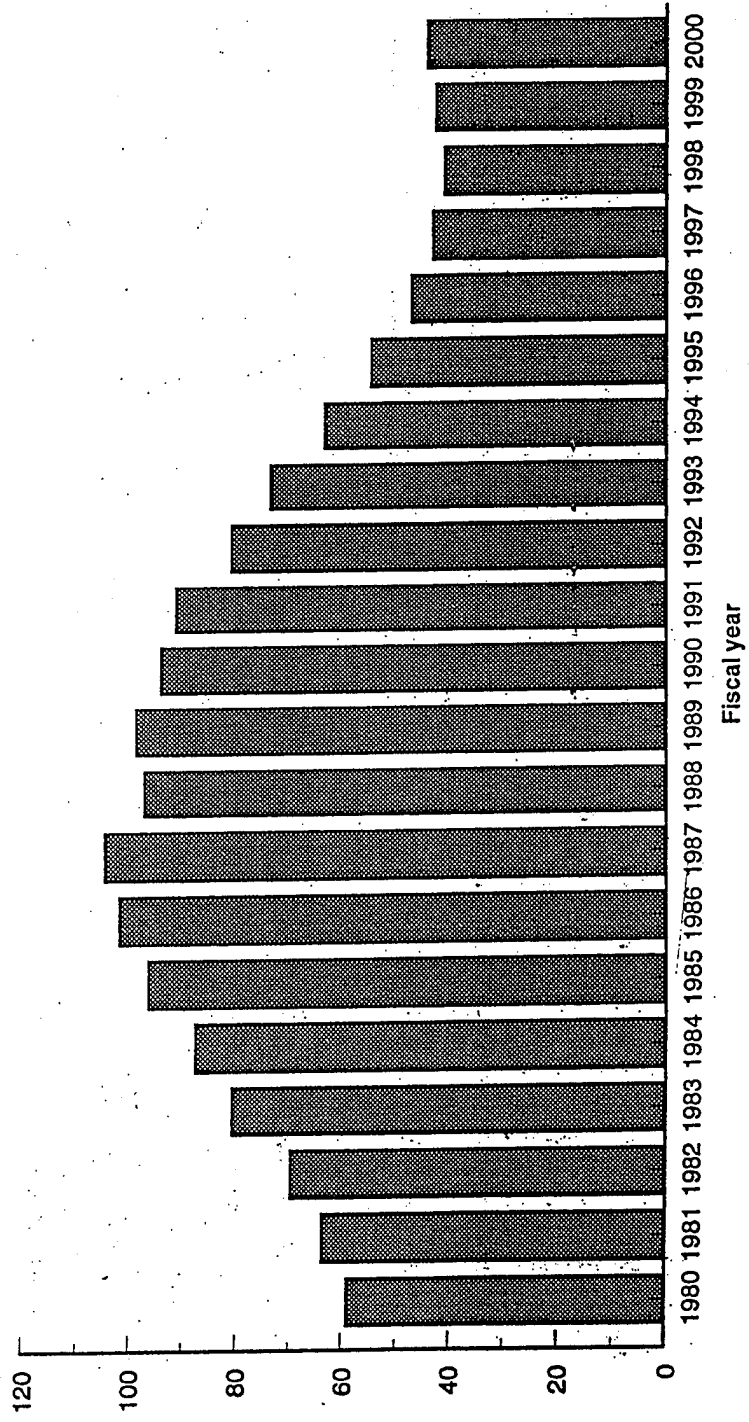
...procurement outlays are projected to decline from a peak of \$104.9 billion in fiscal year 1987 to \$44.4 billion by fiscal year 2000, a reduction of about fifty-eight percent. The procurement account is important to defense contractors because it is the funding source for the products they sell... [Ref. 34]

Figure 9 depicts the fluctuation in DOD procurement outlays and projected outlays for the period 1980 to 2000 in constant year 1995 dollars.

²DOD outlays stated in constant year 1995 dollars.

Figure 9. DOD Procurement Outlays

Source: United States General Accounting Office



As a result, the DOD has been forced to cancel, terminate, or reduce the production of a large number of existing and planned procurements. [Ref. 35] DOD procurement spending reductions have increased the competition between defense contractors for scarce procurement funds, and have compelled them to exploit every available opportunity to improve their competitive advantage. Total quality initiatives have been widely utilized by defense contractors, and U.S. industry as a whole, to improve their competitive advantage.

Reductions in procurement expenditures have also impacted DCMC, decreasing the level of funding available for the fulfillment of its mission. As a result, it became incumbent upon DCMC to investigate strategies which would reduce acquisition and contract administration costs for goods and services procured by the DOD.

During the same period that DOD budget reductions were becoming a reality, the environment in Government and industry was changing in other respects. A business philosophy focused on satisfying customer requirements and improving efficiency was becoming more prevalent throughout the United States in both the public and private sectors. It was during this period that the DOD began to embrace the total quality ideology.

Historically, defense contract administration functions were prescribed by rigid exacting regulations. The focus was

often oriented toward end-item inspection and compliance, and an accept or reject mentality. This system often created an adversarial relationship between the Government and its contractors.

DCMC was also faced with a situation in which it had a number of programs and initiatives for use by its field offices in contract administration, but with no overarching philosophy to tie these programs together.

In short, DCMC was faced with an environment in which resources were constrained, improvements in efficiency and effectiveness were required, utilization of total quality initiatives was desired, and an overarching philosophy for contract administration was needed. During this same period, Government contractors were actively investigating initiatives which would allow them to improve their efficiency and effectiveness, including total quality management, and teaming with their customers and suppliers. It was in this environment that DCMC's Performance Based Management (PBM) philosophy and PROCAS programs emerged.

The PBM concept is designed to provide a means by which contract administration resources can be allocated based upon the proven effectiveness of contractor performance.
[Ref. 36]

Simply put, PBM is applying the right people... at the right place... at the right time...doing the right things. [Ref. 37]

The PBM concept sought to utilize data collected from a number of sources to enable DCMC to make resourcing and oversight decisions. Sources for the data utilized in making these decisions included: inputs from customers, the results of internal reviews, Inspector General (IG) reports, General Accounting Office (GAO) reports, the Contractor Risk Assessment Guide (CRAG) Program, and contractor supplied data. [Ref. 38] [Ref. 39]

Fundamental to this PBM philosophy was the development of a process oriented program to provide a seamless approach to contract administration. This approach was founded on the principles of teaming, identification of key processes, and development of metrics, and was designed to provide the information required for making PBM decisions. This new philosophy was christened Process Oriented Contract Administration Services (PROCAS). [Ref. 40] The goals of PROCAS are as follows:

- Encourage increased communication among DCMC, customers, industry, and DCAA.
- Measure contractor performance and continuous process improvements utilizing shared data and mutually agreed upon criteria.
- Provide objective data and visibility in order to make informed decisions.
- Provide a seamless approach to contract administration by crossing functional, business, and technical boundaries.
- Reduce the frequency of formal audits and reviews. [Ref. 41]

PROCAS was designed to provide a more efficient, effective, total quality approach to contract administration. It was envisioned as a new way of doing business with contractors. More than just a new program, PROCAS was visualized as a fundamental paradigm shift in the orientation of DCMC's contract administration process and in its relationship with contractors. [Ref. 42] The main features of the PROCAS philosophy are:

- Multi-functional teaming within DCMC plus the contractor, customer and DCAA.
- Process identification, understanding, and prioritization.
- Data collection and analysis.
- Process correction through continuous improvement.
- Redistribution of DCMC resources based upon process performance. [Ref. 43]

DCMC's hope was that PROCAS would enhance customer satisfaction with the products and services provided by defense contractors and DCMC. Government/industry team members were encouraged to identify process improvements that, when implemented, would justify extending the frequency or eliminating entirely the need for formal, externally conducted reviews and audits. These changes however, were required to be founded upon objective evidence showing that Government interests would not be compromised. As such, PROCAS relied more heavily on the professional judgment and initiative of

DCMC personnel, empowering these individuals to ensure Government interests were protected. Although professional latitude is increased under PROCAS, it does not permit deviation from applicable laws, the terms and conditions of the applicable Government contracts, or Government policies and directives. [Ref. 44]

PROCAS grew out of individual initiatives at several contractor plants and was first piloted at seven separate contractor sites. The seven pilot sites were: TRW in Redondo Beach, California; Hughes in El Segundo, California; FMC in Sunnyvale, California; Rockwell in Anaheim, California; Northrop in Pico Rivera, California; Martin Marietta in Denver, Colorado; and Magnavox in Fort Wayne, Indiana. PROCAS implementation was individually tailored to the environment at each of these pilot sites, and incorporated many of the initiatives already in place. Implementation at these pilot sites was voluntary on the part of the contractors, as it is with all PROCAS implementations. [Ref. 45]

As previously mentioned, PROCAS incorporated and replaced a number of previously existing DCMC initiatives. However, the initiatives that were subsumed within the PROCAS strategy differed somewhat between various contractors, as PROCAS sought to incorporate beneficial initiatives already in place at each of the pilot sites. The DCMC initiatives assimilated within PROCAS included: Spectrum, STARS, Manufacturing Systems Review (MSR), Integrated System Evaluation (ISE),

Exemplary Facilities (EF), and In-plant Quality Evaluation (IQUE). [Ref. 46] The specific evolution of PROCAS at Magnavox, and the programs that preceded it will be discussed in Chapter V.

B. THE EIGHT STEPS OF PROCAS

PROCAS was designed to be implemented in an eight-step process. As previously mentioned, implementation at contractor sites is voluntary. However, DCMC field offices are directed to proceed with PROCAS initiatives regardless of contractor participation. Eventually, DCMC plans to implement PROCAS with all of its contractors. The eight-step process allows for tailoring to individual contractors, and may vary across commodity lines, management systems, and among industry cultures. [Ref. 47] The eight stages of PROCAS are as follows:

Step One: Government Planning DCMC prioritizes involvement of contractors based on factors such as relative importance of the contractor's product and magnitude of the improvement opportunity.

Step Two: Teaming Agreement In this step Government personnel approach the contractor to attempt establishment of a teaming agreement. The teaming agreement will include the contractor, military customer, DCMC, and other Government entities such as DCAA. If the contractor does not wish to participate, DCMC personnel will proceed independently with PROCAS initiatives.

Step Three: Team Planning The team specifies plans and schedules for various matters such as training, process identification, establishing metrics, communication tracking, and process assessments.

Step Four: Process Selection This step begins by identifying those processes that are critical to satisfying contractual requirements. Criteria for the selection could include criticality of the end item, dollar value of the process, and impact if failure occurs.

Step Five: Understanding the Process In step five, the team analyzes the processes. The team asks questions such as: What is the process objective? Who are the internal or external customers or suppliers? How does the process flow? What are the contract and process requirements?

Step Six: Selection of Metrics In this step, the team clearly defines objective measures of the processes. The measures include repetitive measures of performance to gauge efficiency and effectiveness, and periodic measures of sophistication to gauge whether processes are stable, mature and predictable. The team identifies a minimum level of performance based on contract requirements. In addition, the contractor is encouraged to establish stretch goals that require innovation and exceptional effort.

Step Seven: Measure, Analyze and Manage The team uses data collected to manage and improve processes. Team management applies a cross-functional perspective and works with customers to facilitate improvements.

Step Eight: Adjust Management Emphasis In the final step, the team adjusts oversight as needed, decreasing oversight of processes that are under control and improving, and increasing oversight of processes that are not in control and require additional improvement. DCMC may also adjust its oversight and audit frequency for processes that are in control. [Ref. 48]

C. MEASURING PROCAS RESULTS

One problem encountered by DCMC with respect to PROCAS was in measuring the effectiveness of the philosophy and the savings achieved through its utilization. As with any initiative of this type, upper management within DCMC desired

metrics for the measurement of the success of PROCAS. While the initiative was being prototyped at the seven pilot sites, no formal metrics existed. Eventually metrics were developed for the measurement of PROCAS success. For fiscal year 1995 DCMC District Commanders were required to report on the following metrics:

1. Number of PROCAS teaming agreements For reporting purposes a teaming agreement represented a nonbinding top management arrangement (written or oral) between a DCMC field activity and a contractor facility.

2. Number of processes greater than or equal to PROCAS step five This metric represents the number of joint Government/contractor teams focusing on a Government or contractor owned process.

3. Total number of critical processes This reporting requirement represents the number of processes determined at PROCAS step four to significantly affect cost, schedule, or technical performance of the product or service provided.

4. Number of critical processes at step eight with surveillance reduced A subset of number two above, this metric measures processes in which PROCAS has resulted in tangible benefit to customer(s) the contractor(s), i.e., product quality improvements, reduced cost, shorter cycle-time, and surveillance accomplished with fewer DCMC resources.

5. Number of contractor Continuous Improvement Opportunities (CIOs) resulting outside a formal PROCAS teaming agreement This metric measures the number of suggestions by DCMC personnel to contractors for the improvement of contractor-owned processes when no formal PROCAS teaming agreement exists with the contractor.
[Ref. 49]

DCMC also attempts to collect data on cost savings and cost avoidance obtained through PROCAS, although this process is exceptionally difficult. Utilization by DCMC of its

automated Process Improvement Network (PIN) has enabled them to improve the capturing of PROCAS fiscal results.

The metrics employed by DCMC in measuring PROCAS success continue to evolve. The proposed metrics for fiscal year 1996 consisted of just two:

1. Critical contractor processes at PROCAS step eight with surveillance reduced

2. Acquisition and DCMC cost savings and avoidances from process improvements

One area that is not currently addressed by DCMC's metrics for PROCAS is customer satisfaction. Although individuals interviewed for this study unanimously agreed that the improvements achieved through PROCAS (i.e., quality improvements, increased responsiveness, better compliance with schedules) have enhanced customer satisfaction, it is difficult to measure these achievements.

D. SUMMARY

Process Oriented Contract Administration Services (PROCAS) is a DCMC initiative designed to apply the tool of total quality management to contract administration. It was created by DCMC in an effort to provide contract administration services more efficiently and effectively in a resource constrained environment. PROCAS supports DCMC's philosophy of performance based management, an approach designed to allocate contract administration resources based

on the determined level of contractor risk. PROCAS replaced a number of previous initiatives including Exemplary Facilities (EF) and In-plant Quality Evaluation (IQUE). The initiative was first piloted in the early 1990s at seven contractor plants, including Magnavox Electronic Systems Company in Fort Wayne, Indiana. PROCAS is implemented in an eight stage process. DCMC has utilized a variety of metrics to measure PROCAS success, and collects data on cost savings and cost avoidance resulting from PROCAS initiatives with its contractors.

V. PROCAS IMPLEMENTATION AT MAGNAVOX

A. ENVIRONMENT

In the late 1980s, Magnavox was experiencing significant problems despite its longstanding emphasis on total quality. DOD budget reductions had created uncertainty as to the future of the firm's business base. Magnavox was being forced to eliminate excess capacity and down-size its workforce as a result of its declining business volume. Morale among the remaining employees was low as they confronted their unpredictable future. The situation was complicated by the fact that the North American Phillips Corporation was offering Magnavox for sale. This heightened the sense of insecurity among Magnavox's employees, as a new owner might desire to divide Magnavox and sell it piecemeal.

During this period, Magnavox was encountering delinquent delivery and product quality problems. Over ten percent of the firm's contracts were experiencing delinquency problems, many as a result of delinquent data packages. Difficulties with two Army fixed-price development contracts for communications equipment became so severe that settlement through an alternate dispute resolution process became necessary. [Ref. 50] Problems with electrostatic discharge in a number of Magnavox's manufacturing processes also required high-level intervention on the part of the Government to force compliance with standards. [Ref. 51]

During the period 1987 to 1989, a Government lawsuit against Magnavox for the use of Government-Furnished Property (GFP) in the production of commercial items resulted in a \$1.2 million settlement. This situation resulted not from intentionally fraudulent practices on the part of Magnavox employees, but because of a lack of knowledge. Individuals outside the property administration domain, particularly those in engineering, were not aware of the regulations and requirements for working with GFP and Government-Furnished Material (GFM), and in some cases, were not fully aware of the existence of GFP and GFM in their projects. A general misunderstanding of contract clauses relating to GFP and GFM also contributed to the confusion. [Ref. 52]

Tension between the Government and Magnavox was also prevalent during this period. Government Audits and inspections focused on finding as many problems as possible with little regard to recommending solutions. Regulations were strictly interpreted, with little flexibility. An adversarial atmosphere between the Government and Magnavox predominated, exacerbated by the antagonistic personalities of a small number of key individuals on both sides. This resulted in barriers being formed, hindering the smooth flow of operations and information. Small issues became major impasses which required high-level intervention.

As a result of these types of problems, Magnavox was placed on the Government's Contractor Improvement Program

(CIP). This initiative was designed to place increased attention and oversight on a contractor that was experiencing problems. The program represented the Government's effort to mitigate the increased risk perceived in relations with a contractor that was experiencing difficulties. The DCMC District Commander, U.S. Army Colonel Barry Holland, took action to inform Magnavox's DOD customers of the problems being experienced with the firm. He advised current and potential customers to be cautious in awarding additional contracts to Magnavox. [Ref. 53]

During this period, Magnavox's DOD customers were becoming less willing to accept quality problems and delinquencies. The shrinking quantity of DOD procurement dollars were being aggressively pursued by other DOD contractors in the increasingly competitive DOD contracting environment. DOD procurement activities had fewer dollars to manage, and an abundance of companies competing for those dollars. Thus, buying activities could choose lower risk contractors when making an acquisition. Additionally, with fewer awarded contracts to manage, the importance of the remaining awarded contracts and level of oversight applied to them by the customer increased. The DOD no longer had the luxury of throwing money at its problems, procurement dollars had to be used efficiently. Thus, Magnavox saw itself losing new contracts, and incurring increased oversight on those contracts remaining.

At this point the firm began to realize the significance and extent of its problems, and the necessity of taking immediate corrective action. During this period, Mr. Gene R. McAllister assumed the position of Chairman and Chief Executive Officer of Magnavox. Formerly, Mr. McAllister had been President and Chief Operating Officer of the firm.

About this same time the Government's leadership was also changing, with U.S. Navy Commander Leonard Preston assuming the DPRO Commander position.

Total quality initiatives were also evolving and becoming more successful at Magnavox during this period. In mid-1989, the Defense Logistics Agency's In-plant Quality Evaluation (IQUE) Program was implemented at Magnavox. IQUE was a data driven process improvement initiative specifically oriented toward the quality assurance aspects of Government oversight. IQUE relied heavily on statistical process control techniques to achieve its objectives. The IQUE program was considered to have been very successful in improving processes and quality assurance efforts at Magnavox. [Ref. 54]

In late 1990, another total quality initiative, the Exemplary Facilities (EF) Program was tested by DCMC at Magnavox. EF was designed for implementation throughout the DOD's contractor base as a certification program for contractors. The initiative was designed to give contractors who successfully certified their operations and processes an advantage during the pre-award phase of a procurement.

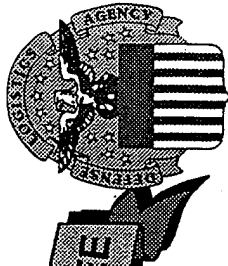
Although the EF program never gained final approval, some of its fundamental philosophies, including teaming and continuous process improvement, served to set the stage for PROCAS implementation. [Ref. 55]

B. PROCAS ARRIVAL

In April 1992, approximately one year after the EF program was terminated, Magnavox was selected as a pilot site for PROCAS implementation. Because the PROCAS initiative at Magnavox had much of its genesis in the EF program, the initiative at Magnavox was termed EF/PROCAS. As permitted by DCMC, no written teaming agreement was prepared for implementation of the PROCAS initiative at Magnavox. [Ref. 56] Instead, the parties preferred to operate under a handshake agreement of cooperation. DCMC wanted to avoid the perception that PROCAS was just another program, and instead wanted it to be perceived as a fundamental change in business philosophy. Thus, DCMC encouraged a less formal agreement of this nature. [Ref. 57] The PROCAS implementation at Magnavox was led by a cross-functional steering committee made-up of senior management personnel, an approach similar to that used by Magnavox in its MTQM strategy. The current membership of this steering committee is shown in Figure 11. Magnavox's new Chairman and Chief Executive Officer, and the new DPRO Commander took the PROCAS initiative very seriously. Both of these individuals



D.P. Molfenter
President &
Chief Executive Officer



Major J.E. Guyll
Commander DCMO
Magnavox

EF PROCAS QUALITY STEERING COMMITTEE

Co-Chairpersons

D.A. McKeeman, V.P., Product Assurance & Life-Cycle Support	R.T. Cassidy Operations Team Chief, DCMO Magnavox
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Sponsors/Staff

W.C. Brush Director, Program & Engineering Management Systems	J.E. McGroarty Director, Business Analysis & Planning	F.G. Perry V.P., Purchasing
B.P. Francoeur V.P., General Auditor	B.K. Menshy V.P. & Director, Human Resources	D.A. Puff Technical Assessment Team Chief, DCMO Magnavox
W.B. Gerwig Director, Ethics	S.S. Meyers Executive V.P. & Chief Financial Officer	J.T. Thompson Sr. V.P. & Director, Operations
J.E. Godfrey V.P., Communications & Information Management	J.E. Owen Sr. V.P. & General Manager, MWD	W.H. Wells V.P., Contract Management
A.A. Koppin V.P. & Deputy General Manager, MWD	T.M. Owen V.P., Marketing	G.A. Wyss V.P., Controller

Source: Magnavox Electronic Systems Company
Figure 30. EF/PROCAS Quality Steering Committee

had management styles that meshed well with the PROCAS philosophy, and they were firmly committed to its success. This commitment was demonstrated by both of these individuals in their willingness to commit their own time, and the resources of their organizations, to the success of PROCAS. [Ref. 58]

DCMC's District Commander, Colonel Barry Holland, was also instrumental, adding a very high-level Government commitment to the endeavor. His support of the DPRO, and empowerment of its staff were important to the success of the initiative.

Early in the PROCAS implementation process, a decision was made by Magnavox to allow DPRO personnel to attend the firm's senior management meetings, and to more openly discuss potential difficulties at these meetings. Previously, when DPRO representatives had been permitted to attend these meetings, Magnavox representatives felt uncomfortable discussing potential problems and challenges (e.g. possible schedule delays, cost overruns, or technical difficulties) for fear that the DPRO representatives would immediately turn this information over to Magnavox customers before the firm could adequately investigate the situation. As a result, the firm frequently had two sets of meetings; one, open to the DPRO representatives, at which no major problems were discussed, and a second, open only to Magnavox personnel, at which the real issues were reviewed. Obviously, this practice was very

time consuming. Magnavox's past hesitancy to meet openly with DPRO representatives was founded not on mere paranoia, but on actual experience with problems being blown out of proportion and reported to customers by DPRO representatives. Thus, the decision to permit DPRO representatives to attend these meetings was considered a leap of faith by many within the firm, and was recognized as such by the DPRO leadership. [Ref. 59]

In consideration for this act of goodwill, DPRO representatives agreed to work in resolving problems rather than immediately identifying them to Magnavox's customers, with the understanding that illegal acts would still be reported as required. [Ref. 60]

Magnavox found that allowing DPRO representatives access to these meetings not only saved time, but it also helped solve many of the emergent dilemmas. DPRO representatives brought with them a vast wealth of varied experience which proved helpful in solving many of Magnavox's problems. Through this action, both sides gained a more thorough comprehension of issues and the importance of these issues to their Government/industry counterpart. Problems were more easily resolved, and an atmosphere of understanding, cooperation and trust began to emerge.

There were a number of individuals, both within Magnavox and the DPRO, who did not believe in the new total quality philosophy. These personnel, some of whom were very senior,

did not wish to participate in Government-industry teaming or process improvement. Their actions proved to be a significant barrier to PROCAS implementation. Both Magnavox and the DPRO Commander took action to depose these individuals or to reassign them to less critical positions. This action further enhanced the spirit of cooperation between Magnavox and the DPRO. [Ref. 61] The individuals remaining in key positions were now those whose modus operandi accommodated the PROCAS philosophy of cross-functional teaming, empowerment, and continuous process improvement.

Another action taken by Magnavox was to allow DPRO and later DCAA representatives direct access to the Magnavox Contract Management System (CMS). CMS is a computerized system designed by Magnavox which includes such functions as accounts receivable, contract management, materials management, property management, and shipping. Workstations that can access the CMS were installed in the DPRO and DCAA offices. Magnavox then provided training on the use of the CMS. Through these workstations, Government representatives could obtain on-line, up-to-date data on nearly any aspect of a contract, including information on schedules, potential delinquencies, cost-to-date, and cost-to-complete.

[Ref. 62]

Having access to the CMS greatly simplified the jobs of many DPRO and DCAA personnel, and in some cases, facilitated staffing reductions.

The inherent quality of the CMS was also a positive factor. Although originally designed for internal Magnavox use, the system is of such high quality that Magnavox is now able to offer it as a commercially competitive product. [Ref. 63]

Once the mutual benefits of allowing Government representatives access to the CMS became apparent, Magnavox allowed their Government counterparts access to other data bases as well. Increased access saved time on the part of Government representatives in collecting the data they needed, and on the part of Magnavox personnel in furnishing the data. Access to the data bases enhanced the atmosphere of goodwill between the Government and Magnavox. Government representatives had greater confidence in the data because they were compiling it directly from the same system utilized by Magnavox. This also gave Government representatives the impression that Magnavox was not attempting to conceal information.

As discussed in Chapter III, prior to PROCAS implementation, Magnavox had a number of total quality initiatives in place. The firm's workforce had become accustomed to total quality practices such as cross-functional teaming and continuous process improvement. Under PROCAS however, these initiatives became more productive as they took on the added dimension of teaming with the Government. Both Magnavox and its Government counterparts in Fort Wayne began

a campaign to train their workers in the tools necessary to make the PROCAS initiative successful. Concepts were made simple and practical. Training concentrated on teaching workers tools that they could apply to their tasks.

Magnavox maintains an impressive library of total quality training material including video cassettes, and a variety of training publications, many of which are designed specifically for the firm and its partners. The total quality office at Magnavox is managed full-time by the Magnavox Total Quality Management Facilitator, a full-time member of the Magnavox management team.

The structure of the EF/PROCAS program at Magnavox is somewhat different from the DCMC standard PROCAS template. Instead of DCMC's standard eight step process, Magnavox utilizes a four level process with fourteen steps. [Ref. 64] The stages and steps are:

Level 4. Identifying and defining the process

- Step 1. Name process owner
- Step 2. Select process management team members
- Step 3. Process description
- Step 4. Establish the process boundaries
- Step 5. List key external inputs and suppliers
- Step 6. Document process flow via a flow chart

Level 3. Process value analysis

- Step 7. Flow chart verification

- Step 8. Analysis of the process for efficiency
- Step 9. List requirements for each process step
- Level 2. Customer/supplier analysis
 - Step 10. Critical process control measurement
 - Step 11. Data collection and feedback systems
- Level 1. Improvement analysis
 - Steps 12-14. Improvement analysis

Initially, there were approximately one hundred processes selected for improvement (PROCAS step four) by the PROCAS Steering Committee. Some were broken down further into sub-processes. The steering committee acted as process sponsor, and chartered cross-functional teams comprised of individuals involved in the processes, including Government representatives where applicable. The teams were comprised primarily of volunteers. An impartial facilitator was also assigned to each team. Once membership on the teams was established, and team members trained, they went about the tasks of studying and flow charting processes (PROCAS step five), developing metrics (PROCAS step six), and improving processes (PROCAS step seven).

Each department within Magnavox maintains an improvement plan that identifies areas where cross-functional teams might be beneficial. These plans are consolidated into a corporate improvement plan utilized by the PROCAS Steering Committee in selecting processes improvement. [Ref. 65]

The mere act of studying and flowing the processes resulted in significant gains. Steps which did not add value were recognized, and processes streamlined. Cross-functional team members began to realize the significance of their work to the process as a whole, and the reasons for the existence of certain process specifications.

The workers constituting the process teams were empowered to select and develop metrics that they could understand and relate to. Visual displays charting the processes and metrics were posted in a manner that allowed individuals involved in the process to view them, most commonly on the shop floor near the location where the process or a portion of the process was performed. Process outputs, achievement of metrics and, statistical process control charts were maintained by individuals involved in the processes. This seemingly simple approach helped to enhance the understanding of the processes among workers, and enhanced their sense of ownership over the processes. During this researcher's tours of Magnavox, these visual displays were evident throughout facilities, and the pride and shown by workers in these displays was obvious.

The majority of the cross-functional improvement teams, once chartered by management, operated with very little management supervision. The workers were truly empowered to perform their PROCAS responsibilities. Initially, this caused uneasiness for some of the workers who were not accustomed to the added responsibility of empowerment, and for some of the

supervisors who were not accustomed to being excluded from the decision-making process. Eventually however, the culture at Magnavox changed, and empowerment became standard practice. During tours of the Magnavox facilities, it was observed that all levels of the Magnavox workforce were comfortable with empowerment as the standard mode of operating.

As process improvement action continued, some processes were refined to the point where process improvement action was no longer advantageous. At this point the process team moved to improve another process. Monitoring of processes that had improved would continue; however, oversight would be reduced where possible. Process teams whose action began to stall received assistance from the Magnavox Total Quality Manager. [Ref. 66]

The change to a total quality environment has been most significant in production. Fully empowered, self-directed process teams now govern their own operations and schedule their own work. Teams are empowered to shut-down production lines if they feel it necessary. These teams also develop and display their own performance data. [Ref. 67]

Quality assurance has also been transformed at Magnavox. Quality assurance personnel are termed "associates" rather than "inspectors", and perform most of their responsibilities through process verification versus end-item inspection. The Quality Assurance Department maintains a statistical quality control database for the entire Magnavox organization, and

uses this database to assist process teams in process improvement efforts. [Ref. 68]

One problem that occurred was that selection of processes in PROCAS step four was accomplished too quickly. As a result, some items that were not true processes were assigned to a team for study and improvement. For example, the company's drug free work place program was selected as a process and assigned to a team. It was later recognized that this item was a program, not a process, and it was deleted from the process list. As mentioned previously, some processes had to be broken down into sub-processes. However, in some cases this did not occur in PROCAS step four, as should have been the case, and instead an entire family of processes was assigned to a single team. When a team was assigned a non-process to study, or the process assigned was actually a family of processes, the team typically was not very productive, and their efforts stagnated. In some cases, their morale suffered as well.

The PROCAS steering committee realized that spending more time in PROCAS step four to ensure processes identified were truly single business processes was important. Additionally, the committee found that the most substantial gains occurred on processes that crossed functional lines. [Ref. 69]

As workers were empowered to improve processes and their sense of ownership over the processes flourished, they began to resolve problems among themselves rather than involving

upper management. The cross-functional teams proved helpful, not just in studying and improving the process they were responsible for, but in resolving a wide range of additional issues. Communication between the various functional sectors within Magnavox, and between Magnavox and its Government counterparts improved.

Cross-functional teaming was particularly productive in areas where two or more groups who communicated infrequently with each other were critical to the success of a process. This was especially evident with respect to Magnavox's design engineers, as indicated by many of the individuals interviewed for this study. Prior to PROCAS implementation, design engineers were infrequent visitors to the shop floor and production lines. As a result, they were not fully sensitive to the needs of production personnel, and this was often reflected in the design engineers' products. With PROCAS and its inherent cross-functional teaming, design engineers were forced to interact with the production engineers and other individuals who relied on design products. This interaction quickly sensitized the design engineers to the needs and constraints of production personnel. As the benefits of this approach were realized, Magnavox began to utilize integrated product development, in which a production engineer was assigned to the design team. This further solidified the link between design and production. [Ref. 70]

As the PROCAS philosophy became more entrenched within the Magnavox and DPRO workforces, the role of management began to change. Workers involved in the various processes increasingly became the genesis for change rather than management. As this shift transpired, management began to assume more support, team-leader, mentor, and facilitator type roles, rather than those of supervisor, director, and inspector.

As the PROCAS initiative at Magnavox matured, problems with delinquent deliveries became scarce and product quality improved. Once this trend was established, Colonel Holland, the DCMC District Commander acted to ensure its continuity. Where previously he had warned DOD customers of the problems being experienced with Magnavox, he now endeavored to inform customers of Magnavox's success. He felt confident in doing this because he now believed Magnavox was seriously committed to PROCAS and to improving quality and responsiveness.

Colonel Holland also worked to establish an environment that presented, whenever possible, a unified DPRO/Magnavox position on DOD customer concerns and problems. He did this by working with the DPRO staff to ensure that their stance on problems and issues was the same as the stance taken by Magnavox, and that communication with customers was coordinated. Customers would receive the same account of an issue regardless of whether they spoke to a DPRO or Magnavox representative. Differences that materialized were

investigated, discussed, and resolved whenever possible. This action resulted in Magnavox's DOD customers becoming more confident that problems and issues were being adequately managed, and enhanced their faith in both Magnavox and the DPRO.

In August 1992, the DPRO Commander position rotated, and U.S. Navy Commander Danny Shockley assumed the lead for the Government with respect to the PROCAS implementation at Magnavox. Fortunately, the new DPRO Commander was also a proponent of total quality management. If anything, the PROCAS initiative was further energized by his arrival. Commander Shockley worked to continue teaming arrangements with Magnavox. In one instance, Commander Shockley and Gene McAllister, Magnavox's Chairman and CEO, teamed up to present a brief on PROCAS to senior DCMC personnel in the Northeast District (Magnavox was in the Northcentral district). While Commander Shockley spoke, Mr. McAllister operated the overhead projector. Upon the conclusion of Commander Shockley's remarks, the two switched roles. The impression of this seemingly simple act upon those in attendance, individuals accustomed to the traditional adversarial aspects of Government/industry relationships, was nothing short of spectacular. [Ref. 71]

Some individuals interviewed for this study suggested that the increase in Government attention that came with Magnavox's selection as a pilot site for PROCAS might have

contributed to the success of the initiative. The facilities in Fort Wayne received an above average number of high-level visits from Government officials as the PROCAS initiative was developing. This added attention enhanced the feeling among Magnavox personnel and their DPRO and DCAA counterparts that the PROCAS initiative was important, and its success decisive.

Magnavox received additional attention in an arrangement with another PROCAS pilot contractor, Martin Marietta, in Denver, Colorado. Magnavox representatives visited the Martin Marietta facilities and performed a review of the PROCAS initiative there. Upon conclusion of the review, Martin Marietta officials were briefed by Colonel Holland as to the findings of the Magnavox team. Next, Martin Marietta officials visited Magnavox and reciprocated the assessment. This interaction gave both the Martin Marietta and Magnavox teams an enlightened perspective on the operation of PROCAS.

Magnavox also worked to take the philosophy of PROCAS to their suppliers. First Magnavox began to slim its supplier base, concentrating on the establishment of a core group of quality suppliers. The firm then teamed with these suppliers to improve quality and responsiveness. In some cases, Magnavox teamed their design engineers with external suppliers to sensitize suppliers to the firm's needs. Suppliers were invited to visit the Magnavox facilities and interact directly with the individuals using their products. Magnavox also trained suppliers on a no-cost basis in total quality

management techniques such as statistical process control and continuous process improvements. Internally, Magnavox utilizes a supplier management handbook to sensitize its employees on issues relevant to the firm's relationship with its suppliers. In some cases, supplier quality improved to the point where no inspection of incoming materials was required, a practice commonly referred to as dock-to-stock. [Ref. 72]

Magnavox also developed a supplier/customer relationship between some of its internal departments. Design engineers were now producing a product for a customer, as were the workers in the paint shop. This paradigm shift helped workers focus on quality and on meeting the needs of their internal customers.

C. RESULTS

Through its concentration on total quality, including its commitment to PROCAS, Magnavox has reestablished itself as world-class producer of exceptionally high quality, technologically superior products. As mentioned previously, the value of the firm, based on its recent selling price, rose over 124 percent during a period of less than two years. Numerous Magnavox and Government interviewees for this study credit PROCAS and other Magnavox total quality initiatives with much of this increase in value.

As a result of the success of PROCAS at Magnavox and the other six pilot sites, DCMC elected to institutionalize PROCAS across the DCMC commandery in late 1992. [Ref. 73] Magnavox assisted DCMC in this effort by conducting numerous briefs to contractors and DCMC CAOs that were commencing PROCAS implementation. PROCAS has continued to be a very successful initiative across the DCMC commandery. In June of 1994, PROCAS was designated as a DLA reinvention laboratory in support of the National Performance Review (NPR) Reinvention Laboratory initiative.

As a result of its success with PROCAS and other total quality initiatives, Magnavox was selected as the Defense Logistics Agency's Total Quality Award winner in 1993. Additionally, Magnavox was designated by DCMC as a reinvention laboratory for the reduction of the cost of Government contractor oversight. [Ref. 74] DPRO Magnavox was also recognized for its success with PROCAS with its selection as the 1992 Secretary of Defense Superior Management Award winner.

A number of individuals interviewed for this study believed that PROCAS had strengthened the ethical environment within Magnavox, and between Magnavox and its Government counterparts. As cross-functional teaming and sharing of information became commonplace between Magnavox and its Government partners, an atmosphere of understanding and shared goals developed. Both the Magnavox and Government workers saw

each other as partners in the journey toward excellence rather than as adversaries. As this atmosphere of goodwill evolved, the probability of an individual on either side treating the other side in an unethical manner decreased. A number of Magnavox representatives interviewed for this study stated that the awareness of ethical issues among Magnavox's workforce has increased significantly with the implementation of PROCAS.

One problem with the PROCAS implementation at Magnavox, from the perspective of those wishing to measure its success, is a lack of documentation showing achievements. In particular, there is little evidence of the amount of monetary cost savings and cost avoidance resulting from the initiative. During the first year of the PROCAS implementation, Magnavox and its DPRO counterparts were busy with the task of developing PROCAS. They did not focus efforts on measuring their success. In some cases, they did not have an adequate base-line established that would allow them to identify benefits. DCMC was also working on the development of metrics for use in measuring PROCAS accomplishments during this time. Many gains took place during this first year, but there is minimal formal documentation to substantiate them.

[Ref. 75] However, the unanimous consensus from DCMC Headquarters, DCMO Magnavox, and Magnavox Electronic Systems Company representatives interviewed for this study is that the

PROCAS initiative was a resounding success and that it generated tremendous results.

Additionally, as the PROCAS philosophy becomes the standard way of doing business for workers, they are less likely to document savings and achievements. When concepts such as continuous process improvement and cross-functional teaming become entrenched in the organization's culture, workers see the gains achieved as normal and expected rather than something special that must be formally documented. Furthermore, once a total quality culture is established, workers may not even consciously realize that they are doing anything special as they go about their duties utilizing total quality tools. This of course is the ultimate goal of any initiative; to become ingrained in the organization's culture. However, once this happens, benefits may become more difficult to quantify.

Although there is not a great deal of data illustrating specific dollar savings resulting from PROCAS implementation at Magnavox, a number of benefits have been documented. Included in these achievements are the following:

- Many inspections and audits have been waived by the Government or had their scope reduced. In 1995, seven of fifteen categories of the Government-furnished property systems analysis inspection were waived. [Ref. 76] DCAA now permits Magnavox to self-certify many processes. [Ref. 77]
- Efficiency gains and reduced risk have permitted both DCAA and DCMC to reduce their workforces in Fort Wayne. [Ref. 78]

- The number of days required by the DCMO to process and pay progress payments has been reduced from an average of 14.3 in February 1992 to 9.3 in October 1995. [Ref. 79]
- Overage contracts have been reduced from a 25.5 percent overage rate in May 1994 to a 10.1 percent overage rate in October 1995. [Ref. 80]
- Contract delinquency rates have been reduced from 17.65 percent in September 1993 to 2.3 percent in September 1995. During the same period, contract line-item delinquency rates have been reduced from 6.57 percent to 2.01 percent. [Ref. 81]
- Magnavox's on-time delivery rate has increased from fourteen percent in 1989 to ninety-seven percent in 1995. [Ref. 82]

The preceding represent some of the more significant accomplishments achieved through PROCAS at Magnavox, but by no means is this list all-inclusive. Numerous additional benefits were identified during the course of this study. As previously mentioned, it is also likely that many achievements were never formally documented. The ultimate test of the success of PROCAS however, must rest in part with customers' appraisals of the products and services delivered by Magnavox and its Government counterparts. Interviews with DCMC headquarters and DCMO Magnavox personnel indicate that customer satisfaction has improved dramatically since the implementation of PROCAS at Magnavox. Magnavox has been recognized for its superior products and services by a number of its customers including the Defense General Supply Center, and the Sacramento Air Logistics Command. [Ref. 83]

D. SUMMARY

In the late 1980s, prior to PROCAS implementation, Magnavox Electronic Systems Company was a firm with an uncertain future. Since implementation, in April 1992, Magnavox has been transformed into one of the finest contractors with which the DOD does business. This total quality transformation has resulted in significant benefits to Magnavox, DCMC, DCAA, and their employees and customers.

A number of factors contributed to the success of the PROCAS initiative at Magnavox including: top management commitment; sharing of information; empowerment of the workforces; the creation of an atmosphere of trust, goodwill, and high ethical standards; cross-functional teaming; and training of workers. The total quality environment that existed at Magnavox prior to PROCAS implementation also contributed to the success of the endeavor.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The PROCAS implementation at Magnavox has been very successful, and has produced significant benefits, both in efficiency and in effectiveness, for Magnavox, the DCMO, the DCAA field office and the customers of these organizations. The primary benefits of PROCAS that have been identified are:

- **Improved product quality and service** Magnavox is now recognized by a number of its DOD customers as a superior quality product and service provider.
- **Improved compliance with delivery schedules** Streamlining processes has cut cycle times, and reduced delinquency rates.
- **Reduced unit costs** PROCAS has streamlined processes, reduced scrap rates, and improved efficiency. Additionally, as Magnavox increases its commercial business, overhead costs are spread over this expanded business base. This may allow further cost reductions to the DOD.
- **Facilitation of workforce reductions** The efficiency gains achieved through PROCAS have facilitated downsizing of workforces at Magnavox, DCMO Magnavox, and the DCAA field office in Fort Wayne.
- **Improved competitive advantage for Magnavox** Efficiency and effectiveness gains achieved through PROCAS have made Magnavox a recognized superior quality provider to the DOD. PROCAS has also improved Magnavox's competitiveness in the commercial marketplace. Additionally, quality improvements achieved through PROCAS are assisting Magnavox in achieving its goal of receiving International Standard Organization (ISO) 9000 series registration.
- **Strengthening of the Defense industrial base** As firms improve their competitive advantage through PROCAS, and increase their commercial business, they become less reliant on the DOD for survival. This helps to

strengthen the Defense industrial base. Additionally, as firms improve their efficiency and effectiveness, their global competitiveness will be enhanced, further strengthening the domestic Defense industrial base. Standardization and quality improvements achieved through PROCAS will also be useful for firms pursuing ISO 9000 registration, another factor in strengthening their global competitiveness, and reducing their reliance on the DOD.

- **Reduced cost of Government oversight** Contract administration costs at Magnavox have been reduced as a result of PROCAS through such mechanisms as information sharing, contractor self-certification of processes, elimination of Government audits and formal reviews, and reduction of end-item inspection. The program provides an excellent mechanism for continued oversight cost reductions throughout the DOD contractor base.
- **Reduced risk to the Government** The factors listed above reduce the level of risk for the Government in its relationship with contractors.
- **Support of DCMC's performance based management philosophy** In addition to reducing risk, PROCAS also assists in identifying the inherent level of risk associated with contractors and their processes. Identification of this level of risk is the first step in allocation of oversight based on level of risk.
- **Improved relationship between Government and industry** Through teaming, PROCAS helps to improve goodwill between the Government and its contractors. The program also enhances the ethical environment in both organizations.
- **Improved workforce quality-of-life** Empowerment and cross-functional teaming help enhance job satisfaction and morale among workers. This contributes to further productivity gains.

Utilization of the total quality techniques inherent in the PROCAS program is advantageous to all parties involved, both Government and industry. Total quality management offers the unique advantage of facilitating both efficiency and

effectiveness gains simultaneously. It is thus incumbent upon the DOD to continue pursuing initiatives such as PROCAS, particularly in this increasingly resource-constrained environment. This move toward a more fully coupled buyer-seller relationship offers the greatest promise for the long-term vitality of the DOD acquisition sector.

In this environment of dwindling fiscal resources, Government oversight must be tailored to the level of risk associated with a contractor's operations. As stated by the DOD Contract Administration Reform Process Action Team:

It is essential to formulate a process that (1) identifies those contractors where the risk to the Government associated with reducing or not performing oversight is low, and (2) identifies a methodology for adjusting oversight based on contractor performance. [Ref. 84]

The PROCAS program was identified by the process action team as one method of tailoring oversight.

A number of factors can be identified as having contributed to the success of the PROCAS implementation at Magnavox. These factors would increase the probability that any type of total quality transformation would be successful, and are thus applicable to any total quality initiative. The primary factors are:

1. Support and commitment from internal top management This is possibly the most important factor identified. Without the support of top management, PROCAS might be viewed by the workforce as merely the latest program being directed by management. Senior executive support is necessary to clear barriers, authorize the obligation of resources, generate enthusiasm, and demonstrate commitment to the transformation. Top management must believe in the power of PROCAS and display this belief through its actions.

2. Support from superiors outside the organization Senior external support and attention confirms the importance of an initiative for the workers in the organization. The enthusiasm and attention of senior external stakeholders is conveyed downward, galvanizing workers for change. These external officials must also be willing to allow sufficient time and resources for the entity to undergo transformation, and must realize that some disruptions and dilemmas may occur during implementation.

3. Tailoring to the organization Headquarters personnel must allow the implementing organization sufficient flexibility to tailor PROCAS for best fit. Allowing Magnavox to tailor PROCAS implementation to its needs and environment helped ensure the success of the initiative. This tailoring took place not just at Magnavox as a whole, but between different sectors of the organization. Empowering workers to adapt the tools of PROCAS to their needs enhanced their ownership and acceptance of the initiative.

4. The existence of a mandate for change The fact that Magnavox was experiencing significant problems prior to PROCAS implementation helped motivate Magnavox to dedicate itself to the initiative as a means of ensuring its survival. Obviously, this is not a condition that one would artificially create to ensure PROCAS success. It does show however, that PROCAS has great value for contractors experiencing difficulties.

5. Training Training of workers and management is a critical factor in the success of a total quality transformation. Workers must have a thorough understanding of the tools and concepts of PROCAS to facilitate their empowerment. Training must stress tools and concepts in a simple, applicable fashion. Management must also be trained to accept new roles as facilitators and leaders, as opposed to its traditional roles as directors and supervisors.

6. **Information sharing** An environment where problems are openly discussed and information is shared between the Government and industry helps create an atmosphere of goodwill and trust. The problem solving process is improved, and efficiencies are created as duplication of effort is reduced.
7. **A shared goal** The DCMO representatives want to see Magnavox continue as a successful contractor for the DOD. Magnavox's success will ensure the continuity of the DCMO. However, the DCMO representatives interviewed also fundamentally believe that Magnavox is a superior quality contractor. Likewise, the Magnavox representatives believe that the duties performed by the DCMO staff are important to Magnavox's success. Thus, both entities desire to ensure the continued success of their counterpart. The willingness of the DCMO staff to work with Magnavox in resolving problems before taking them to customers, and to coordinate communication with customers was an important aspect of goal sharing.
8. **Periodic reenergization** Occasionally, an initiative of this magnitude requires an infusion of energy, as occurred with the arrival of a new DPRO Commander, and the review conducted by another PROCAS pilot, Martin Marietta. This reenergization could take the form of special workshops, seminars, or training sessions; changes in leadership; visits by senior external officials; or external reviews and assessments.
9. **A preexisting total quality environment** The existence of an extensive total quality program at Magnavox prior to PROCAS implementation helped facilitate the implementation. This environment made it easier for workers to adapt to the concepts and tools of PROCAS, and for the cultural transformation to occur.
10. **The caliber of the workforce** The dedication, professionalism and character of Magnavox's workforce made adaptation of PROCAS more easily accommodated. A number of interviewees for this study attributed the success of the PROCAS initiative to the values and work ethic inherent in Magnavox's workforce.
11. **Removal of barriers** This factor entails the removal of barriers that impede the smooth flow of information between the Government and industry. However, it also includes the reassignment of individuals who will not adapt to the changing culture.

12. **Recognition of achievements** Taking the time to recognize self-directed cross-functional teams for their achievements in streamlining processes is important. Recognition on a group level is more desirable, as it gives equal acknowledgment to all members of the team. This serves to reinforce the team mentality and sense of shared commitment.

13. **Simplicity** Magnavox and its Government counterparts kept the program uncomplicated, avoiding esoteric concepts and slogans. They concentrated on simple tools, visual symbols, and unadorned progress charts that were easy for workers to understand and utilize.

14. **Empowerment of the workforce** Empowerment was a resounding success at Magnavox, and has led to many processes becoming self-directed by workers. As mentioned, empowerment requires adequate training, but it also necessitates a commitment from management to change its style from supervisor to facilitator.

15. **Cross-functional teaming** Many benefits were achieved when all of the individuals involved in a process got together and studied the process. Including Government personnel, supplier representatives, and customers in these teams where applicable added to the success of the cross-functional teams.

16. **Creation of a positive environment** Many of the above factors contributed to the establishment of an atmosphere of trust, teamwork, and goodwill. Workers were energized by this environment to maximize their productivity. Establishment of trust between the DPRO and Magnavox was essential to the success of the PROCAS implementation.

A number of lessons learned were also identified by the Magnavox EF/PROCAS Quality Steering Committee, including the following:

1. **Ensure adequate time is spent identifying processes for improvement** In some cases, families of processes or areas that were not true processes (i.e., programs, projects, or initiatives) were assigned to process teams for study. When these teams were unable to progress with process improvement, team members became discouraged. Spending more time in the process selection stage (PROCAS

step four) would have eliminated many of these problems. Processes selected must be true business processes, and they must represent a single process. The most significant gains occur with processes that cross functional lines.

2. **Ensure workers are adequately trained** Lack of training was identified as having caused the failure of some teams. Workers must fully understand the concepts and tools of PROCAS, and must realize their responsibilities with respect to the program before progressing to process analysis and improvement.

3. **If data showing achievements are desired, mechanisms must be installed to collect these data before process improvement begins** Some of the benefits of PROCAS implementation at Magnavox, particularly cost savings and avoidance, can not be identified because data were not collected to identify these benefits. Collection of data to support achievements should be a consideration during implementation planning.

B. RECOMMENDATIONS

1. DCMC should continue its commitment to PROCAS.

PROCAS has been shown to provide substantial benefits to DCMC, its customers, and the DOD as a whole, as well as to the contractors supporting the DOD. The PROCAS philosophy offers the best hope for improving the efficiency and effectiveness of contract administration, particularly in the DOD's resource constrained environment. PROCAS supports DCMC's performance based management concept, allowing tailoring of oversight to assessed risk. This makes the PROCAS philosophy particularly valuable as a means of reducing the cost of contract administration without increasing the risk to the Government.

DCMC should continue to provide guidance on the PROCAS program to ensure the fundamental concepts of the philosophy are maintained. Periodic reviews by headquarters, training, and workshops will help to maintain the initiative of the program. DCMC should also continue formal recognition of CAOs and contractors for their PROCAS accomplishments.

2. The scope of PROCAS should be expanded where possible.

Implementation of PROCAS is one step toward a more fully coupled buyer-seller relationship between the DOD and its contractors. The total quality management oriented philosophies of PROCAS, including continuous process improvement, cross-functional teaming, and information sharing should be expanded where possible. An effort should be made to more fully involve customer organizations in PROCAS initiatives. Expanding the PROCAS ideology into the pre-award phase of the acquisition cycle would also be beneficial. Teaming could be expanded to program managers and even to end users of a contractor's products. One possible method for expanding teaming, which was mentioned by a number of individuals interviewed for this study, would be to locate a representative of the program management office at the sites of some of their larger contractors. The program management office representatives could then more easily team with the local DCMC CAO representatives, enhancing the seamless nature of the Government/contractor relationship.

Efforts could also be made to expand the PROCAS philosophy to other Government agencies involved with the DOD's contractors (i.e., the Occupational Safety and Health Administration, the Environmental Protection Agency, and the Department of Labor). Information sharing, teaming, and oversight reduction could be accomplished through such expansion.

Contractors should also be encouraged to expand PROCAS initiatives where possible. Expanded involvement of a contractor's suppliers and subcontractors would be a particularly promising endeavor.

3. In measuring PROCAS success, DCMC should increase reliance on customer and CAO input.

Currently, DCMC measures PROCAS success by computing the number of processes which have been improved, and by collecting data on cost savings and cost avoidance. Customer assessments should also be utilized to determine if the end result of a contractor's PROCAS implementation is beneficial. To accomplish this assessment, DCMC should rely on its on-site representatives, the CAO personnel, to determine levels of customer satisfaction. PROCAS entails empowerment, and in supporting this ideology, DCMC must be willing to empower its CAOs to measure customer satisfaction. Empowerment of CAOs and reductions in CAO oversight could result in savings to DCMC as a whole.

4. DCMC should cease measuring the number of processes at PROCAS step eight as a metric for the success of the program.

In the opinion of the researcher, this metric provides little value in determining the success of PROCAS at a contractor's site. Instead, DCMC should concentrate on measuring cost savings and cost avoidance, and on measurement of customer satisfaction (see Recommendation 3).

C. ANSWERS TO RESEARCH QUESTIONS

This section provides answers to the research questions presented in the introduction to this thesis.

1. Primary Research Question

The primary research question for this thesis is: What elements contributed to a successful implementation of PROCAS at Magnavox?

Based on the analysis in Chapter V, sixteen factors were identified that contributed to the success of the PROCAS implementation at Magnavox. Those factors are:

1. Support and commitment from internal top management
2. Support from superiors outside the organization
3. Tailoring of PROCAS to the organization
4. The existence of a mandate for change
5. Training of workers

6. Sharing of Information between the Government and Magnavox

7. A shared goal between Magnavox and its Government partners

8. Periodic reenergization

9. The preexisting total quality environment at Magnavox

10. The caliber of the workforce

11. Removal of barriers

12. Recognition of PROCAS achievements

13. Keeping the program simple

14. Empowerment of the workforce

15. Cross-functional teaming

16. Creation of positive environment

2. Subsidiary Research Questions

The subsidiary research questions and the answers to those questions are as follows:

a. What is PROCAS?

PROCAS is a DCMC initiative designed to apply the tools of total quality management, including cross-functional teaming, continuous process improvement, and empowerment to the contract administration process. PROCAS is designed to more efficiently and effectively provide contract administration in a resource constrained environment. The program supports DCMC's performance based management concept, which allocates oversight resource based on the assessed level of contractor risk.

b. How was PROCAS implemented at Magnavox?

The PROCAS implementation at Magnavox was directed by the EF/PROCAS Steering Committee, which was made-up of senior executives from both the Government and Magnavox. The steering committee was led by the CEO of Magnavox and the DPRO Commander. The EF/PROCAS Steering Committee selected processes for study and improvement. Processes selected were assigned to self-directed cross-functional teams, which included Government representatives where applicable. These teams then analyzed the processes, developed metrics, and improved the processes where possible.

c. What were the issues, problems and barriers that had to be overcome?

The primary barrier/problem was the culture of both the Government (e.g., DPRO Magnavox, and the DCAA field office) and Magnavox, and the relationship between them. Prior to PROCAS, the relationship between these entities was strained, and antagonistic feelings were present. To facilitate the PROCAS transformation, an atmosphere of cooperation, goodwill, trust and common goals had to be created.

d. What steps did Magnavox and the Government take to ensure the success of the PROCAS implementation?

This question was answered by the primary research question. The sixteen factors listed were responsible for the success of the implementation.

e. How has the implementation process been nurtured to maintain momentum?

Periodic reviews of the PROCAS program by the EF/PROCAS Steering Committee has helped to maintain momentum. Expansion of the program to DCAA and suppliers was also a factor. Continual training of workers and recognition of the achievements of the PROCAS process teams were also factors.

f. What actions are required to sustain PROCAS at Magnavox in the long-term?

Continuing to stress the sixteen factors previously mentioned will help to maintain the momentum of the initiative. Periodic assessments from DCMC headquarters, along with guidance, training, and recognition would also serve to sustain momentum.

g. How can the lessons learned at Magnavox be applied to facilitate implementation and utilization of PROCAS at other contractor locations?

Consideration of the sixteen previously mentioned factors would assist in PROCAS implementation at any contractor location. The factors would be applicable to any total quality transformation, as they facilitate the organizational culture change necessary to accomplish such a transformation. Attention to the lessons learned mentioned in Section A would assure that the problems experienced by Magnavox would not be repeated in future implementations.

D. RECOMMENDATIONS FOR FURTHER RESEARCH

The following topics are recommended for further research:

1. Opportunities for expansion of the PROCAS philosophy

As shown, PROCAS teaming at Magnavox has produced significant benefits for all parties involved. Further research could analyze the potential opportunities for teaming with customers (i.e., program management offices, and ultimate customers). Research could also investigate expansion of teaming to a contractor's suppliers and subcontractors. This research could analyze potential benefits of expanded teaming, and recommend procedures for accomplishing increased partnering.

2. Measurement of PROCAS success

Further research could be conducted to develop methods for DCMC and its CAOs to measure the success of PROCAS initiatives, particularly with respect to customer satisfaction. Currently, there is no formal mechanism for analyzing improvements in customer satisfaction resulting from PROCAS initiatives.

ENDNOTES

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